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CERTIFICATION OF SEED WHEAT.

INAUGURATION OF SYSTEM IN CANTERBURY.

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A SYSTEM of certification of seed wheat was inaugurated this season in Canterbury by the Fields Division of the Department of Agriculture, in co-operation with the Department of Scientific and Industrial Research, through the recently formed Wheat Research Committee. The salient features of the scheme are here outlined, and an account is given of the first season's operations.

The object of certification is to render available to merchants and growers lines of seed reasonably pure and free from disease. It is hoped to stimulate the production of such seed by offering the grower a bonus, and its distribution by establishing the fact that its use will render yields more stable, the produce more readily saleable, and bring about marked improvement in the general standard of milling-wheat grown in New Zealand.

It has been proved that the majority of the diseases which each year take serious toll of our wheat crops are seed-borne. Some, in addition to being seed-borne, are carried over from year to year in the soil; but this does not alter the fact that the seed is the most important agency in the distribution of disease, and the loss thus entailed can be almost entirely eliminated by the use of disease-free seed. It is quite within the bounds of possibility for the mycologist and plant-breeder to produce seed which is at least free from the more serious diseases, and certification following its distribution is the logical extension. In the meantime certification merely indicates those crops relatively free from disease, and affords the most practical means of reducing to within reasonable limits the loss which is a very real burden to the grower.

The general standard of purity of our wheats, more particularly as regards the Velvet variety, is far from satisfactory. This aspect of the question is of serious importance to millers, and, in addition, the cause of some loss to growers.

CROP AND GRAIN INSPECTIONS.

It was decided for this, the first season, to limit inspections to crops grown by the Canterbury Agricultural College, Lincoln, and to crops

grown by farmers from seed produced by the College the previous year. It was therefore obviously necessary to draw a distinction between the seed produced by a recognized institution or individual engaged in the production of pure lines and that produced by a grower who is not the originator of the line he is growing. In sealing the sacks the former is given a distinctive red tag and is termed "pedigree certified seed," while the latter is termed "farmers' certified seed," and the certification tag is white. Growers of Lincoln College 1926–27 seed were accordingly circularized and invited to tender their crops for certification if they so desired.

Inspection of the seed is not a reliable means or determining whether diseases are present; moreover, it is extremely difficult to identify impurities and the proportion of such impurities by an examination of the grain. For this reason it becomes imperative to make a careful inspection of each growing crop, and such field inspections become a very necessary and important feature of all certification work.

Growers of crops which passed the necessary field inspection were requested to sign a guarantee to have the threshing-mill thoroughly cleaned down; and in addition to this precaution the first three, and sometimes the last three, sacks from the mill were rejected. The grain was sampled immediately after threshing by an officer of the Department of Agriculture, the sample was graded, and the line accepted or rejected accordingly On acceptance, the grain was machine-dressed under supervision, and the bags sealed and tagged. The certification tag indicates the name of the variety, the grower, and the merchant dressing the seed.

It was decided to limit certification during the 1927–28 season to Solid-straw Tuscan, Hunter's, and Velvet Unfortunately, no Velvet crops passed the necessary standard.

PURCHASE OF WHEAT.

The wheat was purchased by the Department of Agriculture in quantities sufficient to fill orders already on hand from merchants. It was purchased at a uniform price — namely, that price for milling-quality of each variety ruling on 31st March, plus a bonus of 6d. per bushel.

Growers evinced a disinclination to sell under these terms, which explains the reason for so few crops offering. That the date stated often coincides with a period of fall in the market had not been overlooked, but there appeared to be no alternative, and the 6d.-per-bushel bonus appeared more than sufficient to cover any fall in price likely to occur. Disregarding the forward buying, which commenced about December at round about 6s. per bushel for Tuscan, much of the wheat purchased by the Department could have been sold possibly at 5s. 8d. or 5s. 9d. Actually the price fixed on 31st March was as follows:—

Tuscan, 5s. 8d. plus 6d. bonus = 6s. 2d. per bushel.
Hunter's, 6s. plus 6d. bonus = 6s. 6d. per bushel.
Velvet, 6s. 6d. plus 6d. bonus = 7s. per bushel.

Growers are paid as soon as possible after 31st March—that is, as soon as the merchants have received and paid for the seed wheat received by them.

MACHINE DRESSING.

Merchants agreed that one firm and no more in each centre should undertake the dressing of any one variety, and in doing so showed a fine spirit of co-operation, for obviously firms would as a rule desire to attend to the dressing of their own seed. This arrangement enabled each variety to be sold at a uniform price in any one centre, by pooling the dressing-costs, railage, &c., of all lines of each variety. Moreover, it allowed of more even distribution of the lines from different sources.

ESTIMATION OF EX-STORE PRICE.

This price is arrived at for each variety in each centre by the firm dressing that particular variety. The following is an actual example of such a return obtained from one line of wheat. It must be remembered that all lines are averaged to obtain the selling-price of any one variety.

Into machine—	£	s.	d.
251 sacks (840$\frac{27}{60}$ bushels) Tuscan, at 5s. 8d.	238	2	6
Bonus to grower, at 6d. per bushel	21	0	2
Railage	6	13	3
Receiving, at 2s. 3d. per 10 sacks	2	16	5½
Delivery ex store, at 2s. 3d. per 10 sacks	2	16	5½
Cleaning, at 4d. per bushel	14	0	2
Haulage on 314 bushels, at 1d. per bushel	1	6	2
	286	15	2
Less offals, 22⅓ bushels, at 4s. 3d. per bushel	4	14	11
	282	0	3

Ex machine—
814$\frac{48}{60}$ bushels cost £282 0s. 3d. = 6s. 11d. per bushel.

[NOTE.—In the above return no allowance has been made for the following items, because they were not actually expended in this instance: Sampling, at 9d. for 10 sacks; branding, at 4s. 6d. per 100 sacks; storage, 3d. per 10 sacks per week; insurance, 1s. 6d. per cent. per month.]

FIXING OF SELLING-PRICE.

It will be seen that it is possible to fix the selling-price from the ex-store price by adding the merchant's commission. The following scale agreed to allows for storage, interest, and other charges in the example just quoted:—

Ex-store price, 6s. 11d. per bushel.
Plus merchants' commission, 6d. per bushel.
Price for April—Cash 7s. 5d., booked 7s. 7d., per bushel.
Price for May—Cash 7s. 5½d., booked 7s. 7½d., per bushel.
Price for June—Cash 7s. 6d., booked 7s. 8d., per bushel.
Price for July—Cash 7s. 6½d., booked 7s. 8½d., per bushel.

RESPONSE BY MERCHANTS AND WHEATGROWERS.

Decision regarding the inauguration of certification was arrived at during December last, and organization was necessarily hurried. Neither merchants nor growers really had sufficient opportunity for discussing the scheme, but the response by merchants was most encouraging. The North Canterbury Grain and Produce Merchants' Association backed the scheme whole-heartedly, and rendered most valuable advice and assistance. Growers responded very tardily, and their justification for this attitude has already been explained.

The following areas were inspected :—

	Inspected. Acres.	Passed Field Inspection. Acres.
Solid-straw Tuscan	97	97
Hunter's	250	118
Velvet	126	Nil.

A few growers withdrew their crops, and the following actually sold grain which was certified and sealed :—

A. E. Tutton, Broadfields	Solid-straw Tuscan.
D. Jones, Dunsandel	,,
J. F. Dawson, Fernside	,,
T. H. Wilkinson, Spotswood	Hunter's.
Geo. McCullough, Temuka	,,
E. W. Milne, Greenpark	,,

Merchants came forward with orders for 2,300 bushels of Solid-straw Tuscan, 1,940 bushels Hunter's, and 836 bushels Velvet. It was obvious that orders would have to be filled *pro rata*, and a number which arrived late had to be refused. These are not included in the above.

Exclusive of Lincoln College, which has produced all the pedigree certified wheat this season, the following firms have purchased and been supplied with farmers' certified seed wheat :—

Dalgety and Co., Ltd., Christchurch.
New Zealand Farmers' Co-operative Association, Ltd., Christchurch.
Wright, Stephenson, and Co., Ltd., Christchurch.
Canterbury Seed Co. (N.Z.), Ltd., Christchurch.
National Mortgage and Agency Co., Ltd., Christchurch.
Wood Bros., Ltd., Christchurch.
Matson and Co., Christchurch.
Darling and McDowell, Oamaru.
Wright, Stephenson, and Co., Ltd., Oamaru.
New Zealand Farmers' Co-operative Association, Ltd., Leeston.
Grain and Produce Merchants' Association, Blenheim.

GENERAL.

Mr. H. B. Veitch, Government Grain Grader, was appointed to supervise the grading, purchase, and distribution of the wheat, and it is very largely due to his expert knowledge and capable management that the scheme has been brought to a successful issue.

A somewhat full account of the scheme has been presented—fuller perhaps than is justified by the amount of wheat handled this past season. It is confidently anticipated, however, that the system will extend, and the present opportunity has been taken of bringing the details to the notice of those who are interested and securing wider publicity in general.

MIXING FERTILIZERS: "POTASH SALTS."

THE fact that certain potash fertilizers are sold under the name of "30 per cent. (or 20 per cent.) potash salts" has apparently led to uncertainty in the minds of some readers making use of the fertilizer-mixing chart published in the *Journa* for September, 1926, and in Bulletin 129. It should be clearly understood that the term "potash salts" appearing in the chart refers to all potash compounds, including kainit and sulphate and muriate of potash.

TESTING OF PUREBRED DAIRY COWS.

REVIEW OF THE NEW ZEALAND CERTIFICATE-OF-RECORD SYSTEM IN 1927.

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THE summary of results under the C.O.R. system for the calendar year 1927 shows that 529 certificates were issued during the twelve-month. In comparison with the preceding year this represents a decrease of forty-seven certificates. It is noticed, however, that in the majority of classes the average production has increased, which fact admits of two interpretations—either the quality of our purebred dairy stock is improving, or breeders are more carefully selecting their test teams. Probably there is something to be said on either side. A review of the production of C.O.R. cows since the commencement of the system indicates that much progress in average yield has been made, but of later years conditions have led to curtailed and more carefully chosen C.O.R. entries.

THE OFFICIAL HERD-TEST AND C.O.R.

The Official Herd-test, introduced last spring, is meeting with encouraging support. This test is open to all breeders entering cows for certificate-of-record test, and all registered purebred dairy cows are eligible. The system is also open to cows other than purebreds in those districts where no other means of having the cows tested (Group, Association, &c.) is conveniently available. Particulars of the "O.H.T." were published in the *Journal* for July, 1927, but for the benefit of those who are not informed as to the system it may be briefly outlined as follows: The Official Herd-test is carried out by C.O.R. testing officers at the time of their usual monthly visits. The testing officer takes a note of the milk-yield of O.H.T. cows for the same period as for C.O.R. cows. He also takes samples for two milkings. The owner takes no milk-weights, and from the testing officer's figures for milk yield and test the returns for the month are figured in the head office of the Dairy Division. The O.H.T. is for a maximum period of 305 days—that is, a ten-months test—as compared with the full-year test under the C.O.R. system.

During the height of the present season there were 214 breeders testing 605 cows under the C.O.R. system. Of these, 111 breeders were testing 1,506 cows under the O.H.T. system. This must be regarded as gratifying support, and it is also pleasing to find that, although the O.H.T. was looked upon as more or less an experiment, no criticism of any importance has so far been levelled against it. Further, although the first year's rules may require a little extension, it is not anticipated that they will need more than minor amendment. It may also be mentioned that the number of C.O.R. cows per breeder has not decreased as the result of the introduction of the Official Herd-test. A complete survey of the O.H.T. system in 1927-28 will be published in the *Journal* at the termination of the season.

CERTIFICATES ISSUED.

Since the commencement of the C.O.R. system 5,777 cows have been granted first-class certificates. During the year 1927, certificates were issued on first performance for 449 cows, and on second or subsequent performance for 80 cows, making a total of 529 certificates. Details are given in the following table, figures for the preceding year being also given for purposes of comparison:—

Table 1.

Breed.	1927.			1926.		
	Ordinary.	Repeat.	Total.	Ordinary.	Repeat.	Total.
Jersey	333	50	383	371	57	428
Friesian	65	24	89	94	16	110
Milking Shorthorn ..	25	3	28	9	3	12
Ayrshire	16	1	17	15	1	16
Red Poll	10	2	12	8	2	10
Totals ..	449	80	529*	497	79	576

* Representing 528 cows, one cow having qualified for two certificates within the year.

Second-class Certificates.—Only twenty-two second-class certificates were issued in 1927. These went to twelve Jerseys, nine Friesians, and one Red Poll. These numbers are obviously too small to permit of division into classes, but, grouping the cows of each particular breed into one class, the twelve Jersey records average 523·91 lb. butterfat, and the nine Friesians 523·32 lb., while the one Red Poll yielded 347·07 lb.

Readers will recall that the rules governing C.O.R. testing provide that for first-class certificates the period between calving for commencement of test and calving subsequent to test shall not exceed 455 days (fifteen months). For second-class certificates an extension to 485 days (sixteen months) is permitted. The average period between calving for test and calving subsequent to test for all cows which gained first-class certificates in 1927 was 393 days. For second-class C.O.R. the period was 468 days. This compares with 391 days and 470 days respectively for the preceding twelve months.

JERSEYS.

Class-leaders.

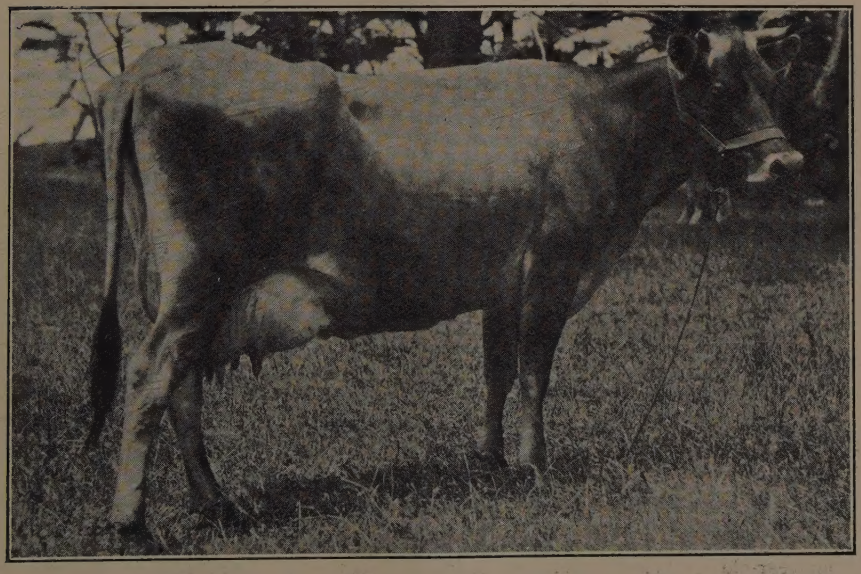
The list of Jersey class-leaders shows two changes for the year under review. These occurred in the junior two-year-old and the four-year-old classes. In the former class Mr. G. E. Yelchich's Keston Flower, 694·28 lb. butterfat, gives way to Ivondale Oxford Lass, which gained a certificate for 731·29 lb. Ivondale Oxford Lass was owned during her testing-period by Mr. R. S. Tuck, of Waharoa, although she was bred by Mr. P. J. Peterson, of Brixton, Taranaki. In the four-year-olds Mr. A. J. Smith's St. Lambert's Bell, 780·32 lb. butterfat, is replaced by Mr. G. E. Yelchich's Keston Flower, which raises the highest performance of this class to 814·95 lb. Thus Keston Flower,

although defeated in one class, still holds a place in the list of class-leaders. She was bred by Mr. C. B. Herrold, of Waiuku, while her certificates were gained under the ownership of Mr. G. E. Yelchich, of the same centre.

The Jersey class-leaders are now as follows:—

Table 2.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Ivondale Oxford Lass	R. S. Tuck, Waharoa..	1 338	240·5	365	12,107·7	731·29
Senior Two-year-old.						
Ivondale Golden Rainbow	P. J. Petersen, Waitara	2 311	271·6	365	12,962·2	768·46
Three-year-old.						
Ivondale Golden Lass	P. J. Petersen, Waitara	3 312	308·2	365	14,434·8	905·01
Four-year-old.						
Keston Flower ..	G. E. Yelchich, Waiuku	4 64	319·9	365	14,679·2	814·95
Mature.						
Holly Oak's Annie..	W. T. Williams, Pukehou (deceased)	5 9	350·0	365	18,522·7	1,056·49



KESTON FLOWER (G. E. YELCHICH, WAIUKU).

Leader of the Jersey four-year-old class.. .. [*Dairyfarmer photo.*

Jersey Class-averages.

Three of the Jersey classes show an increase in average production for 1927 as compared with 1926, while in the two remaining classes there is a slight decrease. Taken as a whole the average Jersey for 1927, with 469·36 lb. butterfat, produced 7·68 lb. butterfat more than the average Jersey for the preceding year. A total of 383 cows is represented for 1927, and, as is usual, the largest classes are the junior two-year-old and the mature; in fact, the junior two-year-olds, 167 in number, represent 43½ per cent. of the Jerseys certificated during the year. The length of average lactation—349 days—is three days in excess of that for the preceding year.

The class averages for 1927 and 1926 are given in the following table:—

Table 3.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1927.		lb.	lb.
Junior two-year-old ..	167	348	7,280·2	416·07
Senior two-year-old ..	43	348	7,950·9	453·54
Three-year-old	56	348	8,962·3	498·69
Four-year-old	39	354	9,394·0	520·35
Mature	78	353	9,669·9	545·63
	1926.			
Junior two-year-old ..	186	347	7,128·7	399·62
Senior two-year-old ..	51	340	8,059·6	455·22
Three-year-old	61	345	8,784·8	491·43
Four-year-old	33	347	9,405·9	527·11
Mature	97	350	9,794·1	543·13

The averages, class by class, of all certificates issued to Jersey cows since the commencement of the C.O.R. system in 1912 are given in the following table:—

Table 4.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Junior two-year-old ..	1,737	345	6,952·9	388·70
Senior two-year-old ..	487	344	7,693·4	432·69
Three-year-old	692	342	8,351·8	464·43
Four-year-old	427	345	8,821·3	489·81
Mature	1,130	345	9,303·2	509·80
All	4,473	344	8,022·1	445·45

Jersey C.O.R. Bulls.

For the benefit of readers who are not conversant with the details of the C.O.R. system, it may be repeated that a bull is entitled to be called a certificate-of-record bull when he has sired four certificate-of-record daughters, each daughter being from a different dam. In addition, the Jersey Breeders' Association recognizes a special class for what it terms champion butterfat bulls. The qualifications for a champion butterfat bull require that the animal must have at least five C.O.R. daughters from different dams, each daughter having doubled its minimum butterfat requirement for a certificate. Some 266 Jersey bulls have now qualified for the C.O.R. list, while twelve of these are eligible for inclusion in the champion class. In the following list champion butterfat bulls are marked †. The list includes those C.O.R. bulls which have added to their number of C.O.R. daughters during the year, or have during that period newly qualified for the class.

Table 5.

Key to numbers opposite names: First number—first-class C.O.R. daughters; second number—ditto, qualified on subsequent performances; third number—second-class C.O.R. daughters; fourth number—total of preceding numbers. Bulls marked * qualified for C.O.R. list in 1927.

Grannie's Knight†	51	11	3	65
Sultan's Disdain	44	11	5	60
Noble Twylish	30	4	0	34
Viola's Golden Laddie†	24	6	1	31
V.C.†	21	3	0	24
Waipiko Masterpiece†	18	6	1	25
Proud Fox	19	8	1	28
Holly Bank Squire†	18	3	2	23
Meadowvale Conqueror	18	3	0	21
Sunflower's Perseus†	16	4	0	20
Bilberry's Twylish†	15	1	2	18
Hawkesbury Emperor	14	6	0	20
Owler of Puketapu†	14	0	3	17
Admiral	14	2	0	16
Bridge View's Magnet	14	1	0	15
Rainbow's King†	13	3	1	17
Brampton Merry Boy	13	0	0	13
Maid's General	12	2	1	15
Aster's Golden Lad	11	2	1	14
Eileen's Fox	11	2	0	13
Fox's Double	11	0	0	11
Woodstock Golden Lad	10	2	1	13
Belvedere Jersey Boy	10	2	1	13
Distinction's Twylish	10	0	1	11
Belvedere Silver Trumpeter	10	0	0	10
Beechland's White Swan	9	1	0	10
Waipiko Leonard	9	0	0	9
Marshlands Masterpiece	9	0	0	9
Majesty's Eminent	9	0	0	9
Sunglow	8	2	1	11
Brentwood Gallant	8	2	0	10
Ivondale's Rainbow	8	2	0	10
Sherry's Fox of Collingwood	8	1	1	10
Cambridge Rata King	8	1	0	9
Golden Reef	7	2	0	9
Miro Meadows Dick	7	2	0	9
Belvedere Sun King	7	1	0	8
Molly's Lad	7	0	1	8
Bessie's Twylish	7	1	0	8
Bright Sultan	7	0	0	7
Mountain View's Rioter	7	0	0	7
Ngahiwi Silent Knight*	7	0	0	7
Willowbrook Lord	7	0	0	7
Tiki's Twylish	6	3	1	10
Miro Meadows Paddy	6	2	0	8
Brentwood Hero	6	0	0	6
Briar's Twylish	5	1	1	7
Roto*	5	1	0	6
Caius	5	0	0	5
St. Aubins Golden Lad	5	0	0	5
Viola's Noble of Glenmore*	5	0	0	5
Fernaig Exile*	5	0	0	5
Marshall Aldan*	5	0	0	5
Miro Meadows Tim*	4	0	2	6
Clarion*	4	0	1	5
Miro Meadows Boss*	4	1	0	5
Reid Park's Teasel*	4	0	1	5
Woodland's Black Boy*	4	1	0	5
Dominion Golden Cygnet*	4	0	0	4
Miro Meadows Pay Day*	4	0	0	4
Rajah of Bulls*	4	0	0	4
Waipiko Lionello*	4	0	0	4
Whenuku Canadian Noble*	4	0	0	4
Reid Park King of Sunbeams*	4	0	0	4
Idalia's Royalty*	4	0	0	4
Miro Meadows Buttermaker*	4	0	0	4
Matchless Raleigh*	4	0	0	4

FRIESIANS.

Class-leaders.

While 1927 added several meritorious performances to the steadily increasing list of our C.O.R. Friesians, the class-leaders for the breed remain as they stood four years ago. Except in the three-year-olds, however, the Friesian class-leadership yields are higher than for any of the other breeds tested under the C.O.R. system; moreover, it is not likely that any of the present Friesian leaders will be seriously challenged during the season now in progress. The list of class-leaders is here repeated.

Table 6.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Monavale Queen Bess	T. H. Richards, Cardiff	2 16	242·1	365	20,501 1	740·50
Senior Two-year-old.						
Netherland Princess 4th	John Donald, Westmere	2 341	274·6	365	19,621·6	805·77
Junior Three-year-old.						
Monavale Queen Bess	T. H. Richards, Cardiff	3 56	282·6	365	21,609·3	800·18
Senior Three-year-old.						
Manor Beets Daughter 2nd of Ashlynn	C. A. Hopping, Palmerston North	3 296	306·6	365	18,733·9	863·51
Junior Four-year-old.						
Westmere Princess Pietertje	John Donald, Westmere	4 156	329·1	365	24,199·0	939·78
Senior Four-year-old.						
Bainfield 27th	C. H. Potter, Pukerau	4 351	348·6	365	23,203·3	910·74
Mature.						
Alcartra Clothilde Pietje	Vernon Marx, Mangatoki	7 355	350·0	365	31,312·5	1,145·24

Friesian Class-averages.

The average C.O.R. Friesian for 1927 produced 502·09 lb. of butter-fat, compared with 483·10 lb. for the preceding year, an increase of 18·99 lb. Of the seven classes into which the breed is subdivided four have shown increases, while the remaining three have failed to maintain the production of the previous twelve months. In all, 89 Friesians were certificated in 1927, a falling-off of 21 from 1926. The class-averages for 1927 and 1926 are given in the following table:—

Table 7.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1927.		lb.	lb.
Junior two-year-old ..	32	346	12,250·0	432·18
Senior two-year-old ..	13	336	12,615·3	455·66
Junior three-year-old ..	7	345	14,681·3	502·82
Senior three-year-old ..	3	161	7,853·8	315·89
Junior four-year-old ..	4	359	17,275·4	610·31
Senior four-year-old ..	5	331	13,968·6	489·10
Mature	25	341	17,449·6	623·13
	1926.			
Junior two-year-old ..	43	331	11,479·7	405·80
Senior two-year-old ..	11	356	14,086·2	492·10
Junior three-year-old ..	9	357	12,727·7	458·16
Senior three-year-old ..	8	331	14,114·1	541·22
Junior four-year-old ..	7	348	17,144·2	598·87
Senior four-year-old ..	4	348	17,062·3	562·36
Mature	28	348	15,723·4	549·41

The following table shows the averages, class by class, of all certificates issued to Friesian cows since the commencement of the C.O.R. system in 1912 :—

Table 8.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Junior two-year-old ..	448	345	11,305·1	401·24
Senior two-year-old ..	203	346	12,263·0	434·66
Junior three-year-old ..	153	341	13,145·3	461·69
Senior three-year-old ..	146	334	13,520·4	482·57
Junior four-year-old ..	96	342	14,713·1	518·88
Senior four-year-old ..	91	346	15,565·6	539·15
Mature	441	339	15,507·7	542·76
All	1,578	342	13,439·2	473·58

Friesian C.O.R. Bulls.

Ninety-two Friesian bulls have now qualified for the C.O.R. class, and of these thirteen are eligible for inclusion in the present summary —that is, thirteen Friesian bulls have added to their number of C.O.R. daughters during the year, or have during that period newly qualified for the class. Four new names were added during the year. The list is given in Table 9 which follows.

Table 9.

Key to numbers opposite names: First number—first-class C.O.R. daughters; second—ditto, qualified on subsequent performances; third—second-class C.O.R. daughters; fourth—total of preceding three numbers. Bulls marked * qualified for C.O.R. list in 1927.

Woodcrest Hengerveld Mechthilde	19	4	3	26	Dominion Woodcrest Beets	9	0	0	9
Rosevale Korndyke Sylvia Posch ..	17	14	2	33	Echo Sylvia Sir Griselda*	8	0	2	10
Rosevale King Sylvia ..	14	3	3	20	Rosevale Plus Triumph	7	3	0	10
Ensign Pontiac Valdessa Fayne	12	2	1	15	King Pontiac Valdessa	7	2	0	9
Woodcrest Pontiac Alcartra	9	2	1	12	Dominion Paul Colantha	7	0	0	7
					Rosevale Inka Sylvia Model*	5	0	0	5
					King Alcartra Pietje* ..	4	2	0	6
					Pareora Cadillac Hero* ..	4	1	0	5

MILKING SHORTHORNS.

Class-leaders.

With the exception of the junior four-year-old class, the Milking Shorthorns experienced no change of class-leadership during 1927. It may be mentioned, however, that the record of Mr. A. J. Melville's Glenthorpe Lady, whose yield of 856·85 lb. butterfat places her at the head of the mature class, was closely challenged by Hon. Mrs. E. J. Blyth's Braeside Sweet Nell 2nd with the excellent performance of 851·21 lb. The new leader of the junior four-year-olds, Matangi Matilda 4th, was also owned and tested by Mrs. Blyth, although bred by Messrs. Ranstead Bros. Matangi Matilda 4th's record is 630·38 lb. butterfat, which exceeds the yield of the previous leader, Matangi Nancy 2nd, by approximately 22 lb. The class-leaders now stand as follows:—

Table 10.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butterfat.
		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old.						
Matangi Quality 4th	Ranstead Bros., Matangi	2 109	251·4	365	14,572·8	591·89
Senior Two-year-old.						
Matangi Quality 5th	Ranstead Bros., Matangi	2 204	260·9	365	11,752·8	542·66
Junior Three-year-old.						
Matangi Quality 4th	Ranstead Bros., Matangi	3 153	292·3	365	16,281·4	678·02
Senior Three-year-old.						
Matangi Ruth 2nd ..	Ranstead Bros., Matangi	3 304	307·4	365	14,032·7	747·86
Junior Four-year-old.						
Matangi Matilda 4th	Hon. Mrs. E. J. Blyth, Kohimarama	4 0	313·5	358	14,640·2	630·38
Senior Four-year-old.						
Matangi Ruth 2nd ..	Ranstead Bros., Matangi	4 355	349·0	340	11,670·3	644·90
Mature.						
Glenthorpe Lady ..	A. J. Melville, Buckland	Mature	350·0	365	20,136·2	856·85

Milking Shorthorn Class-averages.

Twenty-eight first-class certificates were issued to Milking Shorthorns in 1927, compared with twelve for the preceding year The average yield of the twenty-eight cows certificated last year was 445·82 lb. butterfat, as against 508·89 lb. for 1926. Needless to say, however, the influence of individual records defeats satisfactory comparison on a class basis, while the matter of production for age is an important factor when grouping together, irrespective of age, such small numbers of records. The class-averages for this breed for the past two years are as follows :—

Table 11.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1927.		lb.	lb.
Junior two-year-old ..	7	347	6,985·7	310·26
Senior two-year-old ..	1	365	9,727·5	484·07
Junior three-year-old ..	..	..	..	..
Senior three-year-old ..	2	346	10,242·7	410·68
Junior four-year-old ..	2	355	13,941·5	587·40
Senior four-year-old ..	6	334	11,988·0	437·43
Mature	10	338	12,173·1	520·64
	1926.			
Junior two-year-old ..	3	346	10,448·8	435·19
Senior two-year-old ..	1	365	11,752·8	542·66
Junior three-year-old ..	1	300	8,978·2	361·77
Senior three-year-old ..	1	365	13,954·6	688·75
Junior four-year-old ..	1	361	10,142·8	402·19
Senior four-year-old ..	1	365	14,850·0	635·91
Mature	4	337	13,893·9	542·45

The following table shows the average, class by class, of all certificates issued to Milking Shorthorn cows since the commencement of C.O.R. testing for this breed in 1914 :—

Table 12.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Junior two-year-old ..	47	351	8,446·4	346·06
Senior two-year-old ..	24	347	8,511·8	347·17
Junior three-year-old ..	19	334	9,594·2	381·27*
Senior three-year-old ..	19	344	10,776·9	457·88
Junior four-year-old ..	18	349	10,883·2	440·58
Senior four-year-old ..	23	343	11,943·2	469·32
Mature	221	340	11,544·4	461·84
All	371	342	10,809·2	434·86

* No additional cows for 1927.

Milking Shorthorn C.O.R. Bulls.

One bull, Dominion Glaxo of Ruakura, was added to the Milking Shorthorn list during the year, which now totals six. Of the bulls previously qualified only one, Matangi Pride, added to his C.O.R. daughters during the year. The figures for these two bulls are now as follows: Dominion Glaxo of Ruakura, 5—0—0—5; Matangi Pride, 10—0—0—10 (see key at head of Jersey bull list).

AYRSHIRES.

Class-leaders.

The period under review failed to bring any changes to the class-leaderships of the Ayrshire breed. Although several good records were authenticated during the year, none of the existing championship performances was seriously challenged. The list, which remains as at the close of 1925, is reprinted, as follows:—

Table 13.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Fair Maid of Greenbank	W. Moore, Homebush	2 27	243·2	365	12,281·3	673·56
Three-year-old.						
Ivanhoe Stylish Daisy	A. M. Weir, Menzies Ferry	3 312	308·2	365	12,334·2	574·09
Four-year-old.						
Ivanhoe Fancy ..	A. M. Weir, Menzies Ferry	4 308	344·3	365	14,207·7	713·93
Mature.						
Glencairn Brownie ..	A. Montgomerie, Kauwhata	8 360	350·0	365	15,579·4	728·05

Ayrshire Class-averages.

Although three of the four classes into which the Ayrshire breed is subdivided showed an increase in average yield for 1927 as compared with 1926, the average for the breed as a whole has decreased from 440·31 lb. butterfat for 1926 to 411·42 lb. for 1927. The explanation of the decrease is to be found in a study of the mature class for the two years. Out of sixteen Ayrshires certificated in 1926, ten were in the mature class, which that year was a particularly strong class, the ten representatives averaging 504·01 lb. butterfat. On the other hand, only three cows were in the two-year-olds, the lowest-yielding class. In the year under review seventeen Ayrshire cows received first-class certificates, but only five of these were in the mature class, whereas seven were among the two-year-olds. Moreover, the mature class in 1927 was weaker in quality as well as numerically, the average yield of the five cows being 472·78 lb. butterfat, as compared with an average of 504·01 lb. for the ten in 1926. The decrease is therefore not so

serious a falling-off as might at first appear. The Ayrshire class-averages for 1927, together with those for the preceding year, are as follows :—

Table 14.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1927.		lb.	lb.
Two-year-old	7	351	8,418·5	361·81
Three-year-old	3	324	9,853·3	415·35
Four-year-old	2	328	10,664·9	425·75
Mature	5	330	12,508·0	472·78
	1926.			
Two-year-old	3	339	6,454·6	274·22
Three-year-old	1	333	7,897·7	371·73
Four-year-old	2	365	11,426·2	405·22
Mature	10	360	13,125·0	504·01

The following table shows the averages, class by class, of all certificates issued to Ayrshire cows since the commencement of C.O.R. testing in 1912 :—

Table 15.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Two-year-old	50	344	8,720·6	358·66
Three-year-old	30	345	9,817·3	402·29
Four-year-old	23	347	11,263·3	455·57
Mature	90	347	11,847·3	483·96
All	193	346	10,652·1	435·42

Ayrshire C.O.R. Bulls.

Only one name is to be added to the Ayrshire C.O.R. bulls as the result of the year's testing, making a total of seven to date. The new C.O.R. bull is Allandale White Hope, his figures being 5—0—0—5 (see key at head of Jersey bull list).

RED POLLS.

Class-leaders.

One change has taken place in the Red Poll class-leaderships, this occurring in the four-year-old class. Mr. B. W. Harvey's Susie Ann, with 448·48 lb. butterfat, yields place to Wayward 6th B No. 1, owned by Mr. G. S. Young, of West Plains, her record being 580·05 lb. This cow already holds the leadership of the two-year-old class with a certificate for 511·42 lb. butterfat. Moreover, both her records are higher than any other for the breed. The full list is comprised in Table 16.

Table 16.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
		Yrs. dys.	lb.		lb.	lb.
Two-year-old.						
Wayward 6th B No. 1	G. S. Young, West Plains	2 188	259·3	365	11,228·0	511·42
Three-year-old.						
Dominion Gold Top..	Central Development Farm, Weraroa	3 302	307·2	365	9,491·25	459·46
Four-year-old.						
Wayward 6th B No. 1	G. S. Young, West Plains	4 297	343·2	365	13,290·0	580 05
Mature.						
Dominion Sylph ..	Central Development Farm, Weraroa	5 4	350·0	365	11,009·00	505·84

WAYWARD 6TH B NO. 1 (G. S. YOUNG, WEST PLAINS, INVERCARGILL).

Leader of the Red Poll two- and four-year-old classes.

Red Poll Class-averages.

Twelve Red Polls gained certificates last year, an increase of two over 1926. All four classes were represented, although there was only one cow in the three-year-olds. This being so, comparison with the previous year's results is impracticable. The twelve Red Polls certificated last year averaged 372·23 lb. butterfat. Details are given in the following table :—

Table 17.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1927.		lb.	lb.
Two-year-old	7	351	7,780·3	329·75
Three-year-old	1	365	6,441·8	282·57
Four-year-old	1	365	13,290·0	580·05
Mature	3	365	11,369·4	431·98
	1926.			
Two-year-old	4	322	7,257·9	306·86
Three-year-old*	..	..	..	..
Four-year-old	1	354	11,109·3	448·48
Mature	5	312	9,239·3	385·13

* No three-year-olds under test in 1926.

The following table shows the averages, class by class, of all certificates issued to Red Poll cows since the commencement of C.O.R. testing for this breed in 1918:—

Table 18.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Two-year-old	33	341	7,596·4	337·49
Three-year-old	12	345	7,930·9	346·08
Four-year-old	6	343	9,909·1	425·86
Mature	18	331	9,972·3	421·32
All	69	339	8,475·5	368·54

Red Poll C.O.R. Bulls.

No new Red Poll bulls have been added to the list for this breed during the year, and none of the bulls previously qualified has added to his number of C.O.R. daughters. The three Red Poll C.O.R. bulls are Aviator, Belligerent, and Force Majeure.

We again extend our thanks to the secretaries of those breeders' associations who co-operate with the Dairy Division in the carrying out of the C.O.R. testing, and who each year render us much valuable assistance—Messrs. W. M. Tapp (Jersey), J. P. Kalaugher (Friesian), A. W. Green (Milking Shorthorn), R. H. Spencer (Ayrshire), and L. J. Wild (Red Poll).

CLOSING RECORDS FOR 1927.

Only one of the several outstanding records for the year 1927 has been completed since publication of the last C.O.R. list in the March *Journal*. The particulars of this record are as follows: Ayrshire

mature class—Bonnie Girl of Riki, tested by Atkins Bros., Manakau; age at start of test, 7 years 186 days; yield, 10,613·7 lb. milk, 424·66 lb. butterfat, in 263 days.

The fact that a certain number of owners have neglected to advise dates of calving subsequent to test, or to return necessary declarations for cows already qualified, signifies, of course, that the foregoing summary of C.O.R. testing in 1927 is not absolutely complete. The summary of results, however, is already overdue, and it was thought inadvisable to defer its publication any longer.

COMMON AILMENTS OF LIVE-STOCK AND THEIR TREATMENT.

J. LYONS, M.R.C.V.S., Director of the Live-stock Division, Wellington.

IN a country such as ours, where many of those engaged in the primary industries are of necessity compelled to settle in somewhat inaccessible districts, and where transport is not always what could be desired, the lack of veterinary advice and assistance is at times acutely felt, and there are occasions when the farmer must be at a loss to know what to do in order to save the life of a valuable animal. Under such circumstances he is tempted to act on any advice given, whether it is correct or not, and more often than otherwise the dumb animal has to suffer. With a view to assisting settlers who find it difficult to obtain veterinary advice when required, the writer proposes to contribute to the *Journal* a series of notes on the common ailments of stock in this country, together with simple advice on their treatment. Incidentally it is hoped that such advice will help towards lessening suffering among the lower animals.

In order to be in a position to prescribe for ailments occurring among animals the practitioner must have a knowledge of anatomy, physiology, pathology, and also be acquainted with the action the medicines prescribed have on the animal. Without this knowledge one is more or less working in the dark, and much harm may be done, particularly in regard to medicine. It is amazing the faith many stockowners have in so-called remedies of which they are entirely ignorant. These remedies in some cases may result in neither good nor ill, while in others they may be actually harmful; and yet owners will persist in using such preparations for their stock, oblivious of the fact that they do not know what the remedies contain or the action they have on the animal's system. It is not intended to assert that all patent or proprietary medicines are harmful; many of them may serve a useful purpose. A word of warning is necessary, however, against those preparations which are advertised as specifics against diseases for which science has not yet discovered a remedy, and those for which the claim is made that they will cure all and every disease to which our live-stock is subject.

In connection with the first-mentioned category may be particularly mentioned the remedies guaranteed to cure abortion and mammitis in cattle which one sees advertised in many of our agricultural papers.

When the nature of these diseases is taken into consideration it is not difficult to understand how stockowners are deceived by agents selling such remedies. Abortion is due to an organism, and when once this gets into the system the cow becomes a carrier of the disease for life. This does not mean, however, that she will abort every time she gets in calf. She may do so for one or two seasons, after which she usually carries her calf the full time. Should an animal which has aborted be treated with one of the so-called remedies and carry her calf the full time the remedy gets the credit. The result would have been the same without treatment, and so a testimonial may be given where it is not merited. The same remarks may be applied to mammitis, although in this disease the organism may not remain permanently in the system.

If farmers would consult their veterinary surgeon or chemist, both of whom are better able to prescribe for their animals than the vendors of patent medicines, they would be better served at a much less cost. It would be pleasing to think that a warning such as this would have the desired effect. It is to be feared, however, that the individual with the ready tongue and plausible manner (whether by word or in advertisements) will too often continue to profit at the farmer's expense.

Before proceeding to a description of the symptoms and treatment of the more common diseases the importance should be emphasized of good nursing on the part of the stockowner or attendant, without which the best efforts of the physician or surgeon may be unavailing.

Tympany (Hoven) in Cattle.

Tympanites is purely a diatetic complaint, and is caused by the fermentation of food in the first stomach and generation of gases therefrom. It must not be inferred from this that all foodstuffs are given to fermentation. When undergoing the process of digestion it is only in certain classes of food that fermentation takes place, and then only when fed under certain conditions. It is a well-known fact that cows placed in clover pastures or pastures containing a fair sprinkling of clover in the spring of the year—when such pasture is succulent and damp—are apt to become blown; whereas later in the season the same pasture, when it has lost much of its succulence and the weather is dry, may be fed with impunity. In a climate such as ours, where the conditions are practically always more or less damp during the early spring months, such pastures must be fed with discretion if accidents are to be avoided and the best results obtained from the herd.

It is a common occurrence in many districts throughout New Zealand where clover is abundant for the cows in dairy herds to be in a more or less tympanitic state for weeks together, and mortality is not infrequent, more especially in damp weather. Under such conditions an adequate return cannot be expected from these herds. Much of the trouble could be avoided under a better system of animal husbandry. If the animals were kept overnight in a bare paddock or one which is free from clover, and given a quantity of good sweet hay (oaten hay for preference), so that the damp clover pastures were not taken on an empty stomach, the condition would be much less prevalent than at present, and it would also be found that an increased yield resulted. Although careful dieting will go far in eliminating

tympanites among our dairy herds, the complaint, under ordinary farming conditions, cannot be completely avoided at all times.

Treatment.—This will depend to a great extent on the severity of the case. In some instances, when the tympany is not of an acute nature, if the animal is given a few handfuls of good oaten hay or dry bran the swallowing of the material eaten sets up regurgitation, and the gas is expelled.

In the more acute cases the animal is so distressed that it will not partake of anything in the nature of food, and drenches have to be administered. For this purpose nothing seems to answer better than a wineglassful of turpentine in a pint of raw linseed-oil. The mixture should be well shaken before administration. Hyposulphite of soda and tincture of ginger, 2 oz. of each given in a quart of water, will also be found beneficial. In very acute cases, where there is danger of suffocation through the distended stomach pressing on the lungs and the animal is *in extremis*, relief must be given quickly, otherwise fatal results will follow. In such cases the animal's stomach must be punctured and the gas allowed to escape, and for this purpose a trocar and cannula should be used. The puncture should be made on the left side at the most prominent part, which will be found to be a few inches behind the last rib. While the puncture is being made the instrument should be held in a downward and forward direction, and when the puncture is completed the trocar should be withdrawn and the gas allowed to escape through the cannula. A long thin-bladed knife will also answer the purpose, but it is not so satisfactory, and should only be used when the trocar is not available. When the stomach is tapped by the knife method the gas does not come away so freely. This is due to the fact that as the gas escapes from the stomach the organ recedes. The opening in the walls of the stomach is thus dragged away from the opening in the abdominal wall, which prevents the escape of gas.

After a severe case of tympany it is always advisable to give the animal a dose of physic. A good prescription is ¾ lb. to 1 lb. of Epsom salts (according to the size of the animal) to which 2 tablespoonfuls of ground ginger have been added, the whole to be mixed in 3 pints of warm gruel or water and administered, after which the animal should be kept short of food for a few days. If this precaution is not taken, impaction of the stomach is liable to follow on account of the distortion to which it has been subjected.

Although clover pasture when fed in a wet or damp condition is by far the most frequent cause of tympany, this is by no means the only cause. There are other feeds which are also dangerous; in fact, any sudden change in feeding is also a causative factor. Turnips, green oats, ensilage, and brewer's grains are all liable under certain conditions to cause the complaint. Special care should be taken when feeding soft white turnips in damp weather.

Impaction of the Rumen (First Stomach).

This complaint is frequently seen as a sequel to tympany, or it may occur independently. It is caused by overloading the stomach with food.

Symptoms.—The animal is disinclined to move, and will often emit a peculiar grunt. The movements are more or less stiff, the head is

extended, and the back slightly arched, while if the stomach is pressed just behind the last rib a more or less "doughy" feeling will be in evidence, showing that the walls of the organ have lost their tone and have become paralysed. The appetite goes off and rumination is suspended, and if the animal is in milk the secretion for the time being is considerably diminished. Diarrhœa is a frequent symptom at the outset of the complaint, but this is of short duration, and gives place to entire stoppage of the bowel.

Treatment.—A good dose of purgative medicine is indicated in order to relieve the overloaded stomach, and for this purpose nothing answers better than 16 oz. of Epsom salts to which 2 oz. of ground ginger has been added. The whole should be dissolved in 3 pints of thin oatmeal gruel, and given as a drench. If at the end of twenty-four hours the medicine has not acted, it should be followed up with one-quarter of the ordinary dose, to be given every four to six hours until four doses have been administered. It must be remembered that in this complaint the walls of the stomach are inactive and have ceased to function, and that for treatment too much purgative medicine should not be used, as it only weakens and lowers the vitality of the patient. When purgative medicines fail to have the desired effect, much better results will be obtained from stimulants and tonics, and more particularly nerve tonics. From 2 to 4 drams of nux vomica to which 1 oz. of ground ginger has been added, and the whole dissolved in a pint of warm gruel, should be given three or four times a day. Meanwhile the animal should be kept in a sheltered place, and care taken that it is not subjected to extremes of temperature.

The opportunity may be here taken to give a general warning against the use of repeated doses of purgative medicine when treating cattle for digestive troubles. If such heroic treatment is practised it will be found that the end in view has not been accomplished, and that the resisting-powers of the animal have been weakened to such an extent that recovery is almost impossible. If after the administration of one or two full doses of purgative it is found that the desired result has not been obtained, it is useless and even dangerous to continue such a line of treatment. As already indicated, much better results will be obtained by substituting tonics and stimulants, combined, if necessary, with smaller doses of purgative.

Choking in Cattle.

This trouble is caused by a foreign body, such as a piece of turnip, apple, &c., lodging in the gullet. It causes considerable inconvenience to the animal, and may even cause death if the obstruction is not removed.

Symptoms. — The patient is very uneasy, breathes hurriedly, and coughs, and saliva is seen hanging from the jaws owing to the natural gases being unable to escape from the stomach. Tympany is frequently present, and the obstruction may be seen or felt in the gullet. In the majority of cases of choking it will be found that the obstruction has lodged in the upper third of the gullet. Under such conditions its removal is a more simple operation, and attended with less danger to the animal, than if the object had travelled farther towards the stomach before becoming fixed.

Treatment.—For the removal of such an obstruction the animal should be secured by an attendant, and the operator should then insert his hand and arm down the beast's throat until it reaches the obstacle, which can be grasped and removed. Meanwhile the obstruction should be pushed upwards and held in position from outside by a second attendant.

The dislodging of an obstacle which has settled beyond the reach of the operator's arm is a matter attended with considerable difficulty, and frequently with serious consequences to the animal unless the greatest care is exercised by the operator. In this case the obstruction cannot be removed through the mouth. Instead it has to be forced down the gullet until the stomach is reached. For this purpose a probang should be used, the instrument being inserted through the mouth into the gullet until the obstruction is reached and by gentle persuasion dislodged from its position. In such cases the operator should always be careful not to use undue force, otherwise there is danger of rupturing the organ. To avoid this, when the obstruction is reached, the instrument should be withdrawn a few inches, and then quickly and without too much force be brought on the obstruction again; in fact, the obstacle should only be tapped. This in the majority of cases will dislodge the obstacle from its position, and when thus moved it will be found that the muscular action of the gullet carries it into the stomach. It is advisable, however, that the instrument be made to follow the obstruction into the stomach, so as to make sure that the purpose has been accomplished. At the same time the gases lodged in the stomach are able to escape through the probang.

It is seldom that a probang is kept for use on the ordinary farm. The writer, however, has been successful with a length of fairly flexible hose-pipe with the operating end smoothed and hollowed out. The success of the operation depends on knowing how much force to use without rupturing the gullet. Should the latter circumstance unfortunately occur during the operation, blood will invariably appear on the instrument. When it is withdrawn a further swelling will appear around the animal's shoulders, and when pressed the part will have a feeling as if the hand were in contact with stiff paper. This is due to the gases in the stomach passing through the rupture in the gullet and lodging underneath the skin. Under such circumstances the case is not worth persevering with, and the animal should be destroyed.

In cases of choking, more particularly if the case has been a prolonged one, the animal should be kept on a light and easily masticated diet for a few days after the operation, so that the soreness may disappear from the throat. Otherwise the trouble is liable to recur. Further, if tympany is present a light dose of physic is indicated.

(To be continued.)

British Phosphate Commission's Business.—For the year ended 30th June, 1927, the production of phosphates at Nauru and Ocean Islands amounted to 594,825 tons, and sales by the Commission realized a total of £780,000. The Commission's assets were valued at £3,730,000. Liabilities included £1,440,000 owing to the British Government, the same amount to the Australian Commonwealth, and £548,704 to New Zealand.

PASTURE TOP-DRESSING EXPERIMENTS IN OTAGO, SEASON 1927–28.

(Continued.)

R. B. TENNENT, N.D.D., Instructor in Agriculture, and A. A. HUME, A.R.C.Sc.I., Assistant Instructor in Agriculture, Dunedin.

CENTRAL OTAGO.

WITH a view to ascertaining the effect of fertilizers on grassland in the semi-arid region of Central Otago, eleven plots were laid down in that district, three of these being on irrigated pasture, and the remainder on non-irrigated pasture.

In connection with the irrigated plots, it was realized that in order to obtain accurate results even watering over the whole plot would be essential, and, further, that irrigation would have to take place at such times as to ensure maximum growth for harvesting. In the case of two of the irrigated plots this was done. In the case of the third insufficient water was applied, with the result that extremely scanty growth took place over the whole plot, thus giving very inconclusive results. In viewing the results of these irrigated plots it must be borne in mind that under the arid conditions prevailing—namely, some 14 in. of rainfall per annum—the limiting factor of pasture-growth is soil-moisture. Growth can only take place when this is supplied by irrigation. No amount of artificial fertilizer can take the place of water. The top-dressing of pastures in the drier parts of Central Otago must therefore be looked upon as supplementary to irrigation. The results of the experiments for Central Otago are as under:—

Irrigated Pastures.

(12) L. RYAN, GALLOWAY.

This plot is situated on an easy slope of mica-schist soil on Galloway Flat. The pasture was more than twenty years old, and composed practically of rye-grass and white clover. Other grasses, such as Poa pratensis and suckling-clover, were interspersed throughout in small quantities. From a stock-feeding point of view there was undoubtedly too great a preponderance of rye-grass. It was anticipated that top-dressing would induce a stronger growth of clover. The plot was top-dressed on 2nd August, 1927, closed to stock on 10th October, and harvested on 12th December. Results were as follows:—

Table 10.

Number of Paired Plots.	Manure.	Mean Green Weight of Plot.	Significant (S) or Non-significant (N).	Estimated Weight of Hay per Acre.	Value of Hay per Acre.	Cost of Manure per Acre.	Profit or Loss compared with Unmanured Plot.
		lb.		T. cwt. qr.	£ s. d.	£ s. d.	£ s. d.
24	Basic slag ..	40·0	S	1 14 3	8 13 9	0 15 0	1 12 6 (gain)
24	Basic slag and lime	35·1	N	1 10 2	7 12 6	1 8 0	0 1 9 (loss)
30	Superphosphate ..	48·3	S	2 2 0	10 10 0	1 1 0	3 2 9 (gain)
30	Super and lime ..	46·3	S	2 0 1	10 1 3	1 14 0	2 1 0 (gain)
36	Lime	31·7	N	1 7 2	6 17 6	0 13 0	0 1 9 (loss)
..	Control.. ..	29·1	..	1 5 1	6 6 3	..	..

Summary: Lime showed little increase over the unlimed portions. Superphosphate undoubtedly gave the best results, not only in weight but in composition. White clover and suckling-clover showed vigorously increased growth on those plots top-dressed with super. Basic slag also showed increased clover-growth, but to a less marked degree. This plot was evenly irrigated during growth, the results being quite uniform.

(13) R. TOHILL, RAGGEDY RIDGE, GALLOWAY.

This pasture, sown down in 1922, was composed at the date of top-dressing of rye-grass, white clover, Poa pratensis, crested dogstail, and various weed plants. Situated at a fairly high elevation on Raggedy Ridge, it represented a moderate acreage of similar country. Top-dressing took place on 3rd August, 1927, the plot was closed to stock on 1st October, and harvested on 13th December, Results were as below:—

Table 11.

Number of Paired Plots.	Manure.	Mean Green Weight of Plot.	Significant (S) or Non-significant (N).	Estimated Weight of Hay per Acre.	Value of Hay per Acre.	Cost of Manure per Acre.	Profit or Loss compared with Unmanured Plot.
		lb.		T. cwt. qr.	£ s. d.	£ s. d.	£ s. d.
20	Basic slag ..	4·0	N	0 3 2	0 17 6	0 15 0	0 12 6 (loss)
20	Basic slag and lime	4·2	N	0 3 3	0 18 9	1 8 0	1 4 3 (loss)
20	Super	3·4	N	0 3 0	0 15 0	1 1 0	1 1 0 (loss)
20	Super and lime ..	3·9	N	0 3 2	0 17 6	1 14 0	1 11 6 (loss)
25	Lime	4·0	N	0 3 2	0 17 6	0 13 0	0 10 6 (loss)
..	Control.. ..	3·5	..	0 3 0	0 15 0	..	..

Summary: The results on this plot were unsatisfactory, very little growth having taken place. This fact can be solely accounted for by the sparing amount of water applied to the crop. It is anticipated that next year more frequent irrigations will be given, and thus afford a better index to the efficacy of the different fertilizers employed.

(14) G. GARTLY, SPRINGVALE.

The pasture utilized for trial had been sown down six years previous to top-dressing, the chief constituents being perennial rye-grass and red clover. Situated on the western slopes of the Manuherikia Valley, this plot lent itself admirably to even irrigation, and as a result the growth at time of harvesting was most uniform throughout. Top-dressed on 4th August, 1927, the pasture was closed on 1st October, and harvested on 12th December, with results as shown in Table 12.

Summary: Marked differences were observed on the plots treated with superphosphate with and without lime, as compared with the control plots, white-clover growth being most prolific in the super-phosphate strips. Basic slag with and without lime also showed up strongly, but to a lesser degree than those strips dressed with super. It is interesting to note that the limed strips gave an appreciable increase in yield over the control strips.

Table 12.

Number of Paired Plots.	Manure.	Mean Green Weight of Plot.	Significant (S) or Non-significant (N).	Estimated Weight of Hay per Acre.	Value of Hay per Acre.	Cost of Manure per Acre.	Profit or Loss compared with Unmanured Plot.
		lb.		T. cwt. qr.	£ s. d.	£ s. d.	£ s. d.
30	Basic slag ..	30·1	S	1 6 1	6 11 3	0 15 0	0 8 9 (gain)
30	Basic slag and lime	32·9	S	1 8 3	7 3 9	1 8 0	0 8 3 (gain)
30	Super	38·5	S	1 13 2	8 7 6	1 1 0	1 19 0 (gain)
30	Super and lime ..	43·3	S	1 17 3	9 8 9	1 14 0	2 7 3 (gain)
40	Lime	30·2	S	1 6 2	6 12 6	0 13 0	0 2 6 (gain)
..	Control.. ..	24·5	..	1 1 2	5 7 6	..	..

Non-irrigated Plots.

(15) R. J. E. SMITH, WEDDERBURN.

The pasture selected for this trial had been sown down in 1922 with a mixture composed mainly of perennial rye-grass and red clover. At the date of top-dressing, on 6th August, 1927, the pasture was decidedly weak and open, the red clover had disappeared, and brown-top with a slight covering of white clover was mainly predominant. The plot was closed to stock on 21st September, and harvested on 14th December. Results are tabulated below :—

Table 13.

Number of Paired Plots.	Manure.	Mean Green Weight of Plot.	Significant (S) or Non-significant (N).	Estimated Weight of Hay per Acre.	Value of Hay per Acre.	Cost of Manure per Acre.	Profit or Loss compared with Unmanured Plot.
		lb.		T. cwt. qr.	£ s. d.	£ s. d.	£ s. d.
30	Basic slag ..	5·4	S	0 4 3	1 3 9	0 15 0	0 13 9 (loss)
30	Basic slag and lime	6·1	N	0 5 1	1 6 3	1 8 0	1 4 3 (loss)
30	Super	9·9	S	0 8 3	2 3 9	1 1 0	0 0 3 (gain)
30	Super and lime ..	10·4	S	0 9 0	2 5 0	1 14 0	0 11 6 (loss)
40	Lime	5·7	N	0 5 0	1 5 0	0 13 0	0 10 6 (loss)
..	Control.. ..	5·1	..	0 4 2	1 2 6	..	..

Summary: By observation no differences could be noted on any of the strips treated with the various fertilizers. At date of harvesting the general growth all over the plot was poor, and it would have been more advantageous to have delayed harvesting till a later date. This, however, could not be done. As will be observed, the general yield from the different treatments is low, but quite appreciable gains were recorded on those strips treated with superphosphate. Neither basic slag nor lime showed significant increases.

(16) J. CRUTCHLEY, KYEBURN.

A plot was established on the Kyeburn Flats, on soil of a light loamy nature. The pasture selected represented a fairly large area of similar country. The pasture top-dressed had been sown down with rape in 1921, a mixture of rye-grass and white and red clover being used. At the date of top-dressing, on 10th August, 1927, the pasture had run out badly, goose-grass and brown-top showing up strongly. The plot was closed to stock on 1st October, and harvested on 15th December. Following were the results:—

Table 14.

Number of Paired Plots.	Manure.	Mean Green Weight of Plot.	Significant (S) or Non-significant (N).	Estimated Weight of Hay per Acre.	Value of Hay per Acre.	Cost of Manure per Acre.	Profit or Loss compared with Unmanured Plot.
		lb.		T. cwt. qr.	£ s. d.	£ s. d.	£ s. d.
30	Basic slag ..	14·6	N	0 12 3	3 3 9	0 15 0	0 6 3 (loss)
30	Basic slag and lime	15·4	N	0 13 2	3 7 6	1 8 0	0 15 6 (loss)
30	Super	44·7	S	1 19 0	9 15 0	1 1 0	5 19 0 (gain)
30	Super and lime ..	47·9	S	2 1 3	10 8 9	1 14 0	5 19 9 (gain)
40	Lime	12·8	N	0 11 1	2 16 3	0 13 0	0 11 9 (loss)
40	Control.. ..	12·6	..	0 11 0	2 15 0	..	..

Summary: As will be observed from the above table, superphosphate and lime gave the greatest yield, this being largely accounted for by the remarkably heavy growth of white clover growing on strips receiving this treatment. Those strips sown down with superphosphate alone also gave an excellent response, and to the eye the difference between them and the control strip was most striking. Basic slag with and without lime appears to have had little effect. Lime alone does not show results.

(17) S. C. GREER, PATEAROA.

The pasture selected for this experiment had been sown down in 1912 with a mixture of rye-grass, white clover, and crested dogstail. The pasture previous to this trial had not received any manurial treatment. At the date of top-dressing, on 10th August, 1927, it showed signs of considerable deterioration, the presence of a fairly large proportion of sweet vernal and Yorkshire fog being noted A good sole of white clover existed on the pasture. The plot was closed on 8th October, and harvested on 15th December. Table 15 gives the results.

Summary: The strips top-dressed with superphosphate showed up very early after closing the plot, and gave a remarkably good yield. The increased yield over the control strips was due largely to increased white-clover growth, which showed up to the eye in a striking manner. This plot was another instance of the efficacy of superphosphate during its first year of application. The application of lime alone has not given results during the first year, yet a significant increase is noted

in basic slag plus lime as against basic slag alone. A similar increase is to be noted in comparing super plus lime against super alone.

Table 15.

Number of Paired Plots.	Manure.	Mean Green Weight of Plot.	Significant (S) or Non-significant (N).	Estimated Weight of Hay per Acre.	Value of Hay per Acre.	Cost of Manure per Acre.	Profit or Loss compared with Unmanured Plot.
		lb.		T. cwt. qr.	£ s. d.	£ s. d.	£ s. d.
20	Basic slag ..	48·7	N	2 2 2	10 12 6	0 15 0	0 10 0 (gain)
20	Basic slag and lime	52·5	S	2 5 3	11 8 9	1 8 0	0 13 3 (gain)
30	Super	60·9	S	2 13 1	13 6 3	1 1 0	2 17 9 (gain)
30	Super and lime ..	64·0	S	2 16 0	14 0 0	1 14 0	2 18 6 (gain)
30	Lime	41·2	N	1 16 0	9 0 0	0 13 0	1 0 6 (loss)
..	Control.. ..	42·9	..	1 17 2	9 7 6	..	..

(18) M. A. KINNEY, HYDE.

The pasture used for this experiment is situated on rolling country, the soil being of a light natuie. The annual rainfall of this district is low, and heavy grass-growth is exceptional. Sown down in 1906, the pasture had run very largely to brown-top, there being only a small proportion of rye-grass and white clover present. The plot was top-dressed on 11th August, 1927, closed to stock on 8th October, and harvested on 15th December, with results as under:—

Table 16.

Number of Paired Plots.	Manure.	Mean Green Weight of Plot.	Significant (S) or Non-significant (N).	Estimated Weight of Hay per Acre.	Value of Hay per Acre.	Cost of Manure per Acre.	Profit or Loss compared with Unmanured Plot.
		lb.		T. cwt. qr.	£ s. d.	£ s. d.	£ s. d.
30	Basic slag	13·5	N	0 11 3	2 18 9	0 15 0	0 6 3 (loss)
30	Basic slag and lime	14·8	N	0 13 0	3 5 0	1 8 0	0 13 0 (loss)
30	Super	26·5	S	1 3 1	5 18 9	1 1 0	2 7 9 (gain)
30	Super and lime ..	27·9	S	1 4 1	6 1 3	1 14 0	1 17 3 (gain)
40	Lime	12·7	N	0 11 1	2 16 3	0 13 0	0 6 9 (loss)
..	Control.. ..	11·4	..	0 10 0	2 10 0	..	..

Summary: As will be noted, the growth of grass was light throughout. Despite this fact it is extremely important to record that on those strips top-dressed with superphosphate a dense growth of white clover took place. On pastures of this description such a clover growth is extremely valuable, and is exactly what the pastoralist is seeking. The tabulated results emphasize the fact that super plus lime and super alone gave a much heavier all-round growth of herbage than the control strips. Lime alone and basic slag plus lime gave no appreciable increase.

(19) ROBERTS AND CO., MIDDLEMARCH.

The pasture selected for this trial represented a large acreage of similar country. Sown down in 1921, it still remained a fairly good pasture at time of top-dressing, being chiefly composed of rye-grass, cocksfoot, and white clover. Sweet vernal and brown-top were beginning to intrude, however. The plot was top-dressed on 12th August, 1927, closed to stock on 8th October, and harvested on 16th December. Results were as follows:—

Table 17.

Number of Paired Plots.	Manure.	Mean Green Weight of Plot.	Significant (S) or Non-significant (N).	Estimated Weight of Hay per Acre.	Value of Hay per Acre.	Cost of Manure per Acre.	Profit or Loss compared with Unmanured Plot.
		lb.		T. cwt. qr.	£ s. d.	£ s. d.	£ s. d.
24	Basic slag ..	15·0	N	0 13 0	3 5 0	0 15 0	0 2 6 (loss)
30	Basic slag and lime	16·9	S	0 14 3	3 13 9	1 8 0	0 6 9 (loss)
24	Super	25·5	S	1 2 1	5 11 3	1 1 0	1 17 9 (gain)
28	Super and lime ..	26·5	S	1 3 1	5 16 3	1 14 0	1 9 9 (gain)
35	Lime	16·4	S	0 14 1	3 11 3	0 13 0	0 5 9 (gain)
..	Control.. ..	11·9	..	0 10 2	2 12 6	..	..

Summary: Those strips top-dressed with superphosphate showed up to a much better degree than strips receiving other treatment. The increase of white clover on the superphosphate strips stood out quite conspicuously, and accounted mainly for the increase in weight over the control strips. Lime alone showed a significant increase, but basic slag alone did not show any visible signs of having improved the pasture. On first year's results super plus lime and super alone proved much superior to any other treatment.

(20) J. BECK, OTUREHUA.

This plot, situated on rolling-downs country under dry conditions, consisted of a pasture sown down in 1922. Although sown to cocksfoot, rye-grass, crested dogstail, and white clover, at the time of top-dressing practically a pure stand of cocksfoot existed, and this was in a very open condition. Very little white clover was noted throughout the pasture. The plot was top-dressed on 5th August, 1927, and closed to stock on 1st October, but was not harvested. Strict observation was kept on this plot until the end of January. The rainfall during the growing-period was extremely low, and very little growth took place. At no stage could any apparent difference be noted from the various treatments. The growth did not warrant weighing. It is probable that, after the winter rains, interesting results will be obtained next season; for the season 1927–28 there is nothing definite to record.

(21) T. DOWLING, HYDE.

The pasture utilized for this experiment is situated on rolling country. Over twenty-two years of age, it was composed of brown-top, Danthonia pilosa, suckling-clover, and various weed plants. Of an extremely poor nature, it appeared inconceivable that results from

any manurial treatment could be obtained. The plot was top-dressed on 10th August, 1927, and closed to stock on 8th December, but was not harvested. Very little growth took place on the plot. The only difference noted was an increase in suckling-clover growth on those strips top-dressed with superphosphate. No other treatment appeared to have any effect, and at no stage did the state of the plot warrant cutting. On this year's result the expenditure on the various manures showed no justification.

(22) J. E. KEARNEY, RANFURLY.

This pasture had been laid down in 1904 with rye-grass and white clover. During the early part of season 1927–28 the rainfall was extremely low in this locality, and little growth took place on the plot. At the time of top-dressing, on 8th August, 1927, rye-grass and white clover still existed in the pasture, but in an extremely weak and open

FIG. 4. — TWO SUPERPHOSPHATE-TREATED STRIPS SHOWING UP ON J. E. KEARNEY'S FARM, RANFURLY.

condition. The plot was closed on 1st October, but was not harvested. Although the growth was of such a short nature as to preclude harvesting, the plot afforded a most valuable demonstration. The strips top-dressed with superphosphate stood out very clearly, and were composed of a solid mat of white clover, giving splendid feed. This clover-growth contrasted strongly with the miserable strips of untreated grass alongside. It was unfortunate that precise results could not be obtained by harvesting, but several photographs, two of which are here reproduced, were taken, and show how successful the

FIG. 5.—SUPERPHOSPHATE STRIP ON SAME PLOT AS FIG. 4, SHOWING DENSE MAT OF WHITE CLOVER.

application of superphosphate proved on this pasture. Superphosphate in this case undoubtedly justified its application, and proved an unqualified success in promoting good succulent clover growth. Neither basic slag nor lime gave any visible results.

(To be continued.)

CLASSIFICATION OF CATTLE IN NEW ZEALAND.

FOLLOWING are particulars of cattle in the Dominion (including boroughs) for the last two years' enumeration, as compiled by the Census and Statistics Office :—

—	Number on 31st Jan., 1926.	Number on 31st Jan., 1927.
Bulls two years old and over, for stud—		
For beef purposes	12,908	11,972
For dairy purposes	45,945	46,870
Steers two years old and over*	394,547	384,525
Steers and bulls one and under two years old	169,249	158,459
Cows and heifers two years old and over, for dairying—		
In milk	1,181,441	1,181,545
Dry	122,415	121,680
Other cows and heifers two years old and over ..	535,273	482,973
Heifers one and under two years old ..	401,013	384,743
Calves (heifer, steer, and bull) under one year old	589,695	484,962†
Totals	3,452,486	3,257,729

* Including bulls not kept for stud purposes. † Comprising 357,658 heifer and 127,304 steer calves.

THE FEEDING OF LIVE-STOCK.

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III. FOODSTUFFS IN COMMON USE—*continued.*

ENSILAGE.

THE making and feeding of silage is by no means a recent innovation in this country, but circumstances are making its use more general, especially in connection with dairy-farming.

If green crops are cut and put into stacks and left exposed to the air the material undergoes a process of decomposition, due to various agents, which renders it unfit for consumption. But if the same crop is cut and stacked and these processes are kept in check and under control the result is a valuable foodstuff which is neither hay nor decomposed fodder.

It is sometimes stated that by making silage it is possible to save a crop that could not be made into hay owing to wet weather. That is true to an extent, but the best of silage cannot be made out of inferior material such as spoilt hay. The process of converting such hay into ensilage will never restore the lost nutritive value, though it may save the material from complete waste. If the crop to be ensiled is too wet when being handled it will never finish so well. This must be recognized also from the importance of having good dry fodder and good succulent root crops for winter feeding of dairy cows. Silage should be used to replace the roots rather than the hay. Where labour difficulties exist, or in late districts and wet seasons, it is not possible to make good hay, and here is where ensilage-making is valuable, especially where fodder is scarce.

Before a crop can be regarded as suitable for silage-making it must give a reasonably good yield per acre. It must lend itself to close packing also. That is how maize is so suitable for the process. Being solid-stemmed, once it is cut up the air is more or less easily excluded compared with crops which are hollow-stemmed. The hollow-stemmed crops need great care, and if this is not exercised moulding is sure to take place, with bad results in feeding. The ensiled crop should also have a fair percentage of soluble carbohydrates, for it is these which form the lactic and other organic acids which so effectively control the whole process. A crop of high protein content is good but for the fact that it is liable to putrefy. This is prevented if there is also present an abundance of soluble carbohydrates.

Maize is without doubt the most suitable crop for silage-making—hence the great extent to which it is used in America. The most important materials, so far as we are concerned, are the grasses and clovers and lucerne, while, generally speaking, the most suitable all-round special crop is oats with a mixture of legumes, such as peas, beans, vetches, or tares. Some districts, of course, have the opportunity of making maize ensilage. The oat and legume crop may contain a little too much protein for an ensilage of the best keeping-quality, but if handled properly its feeding-value, especially for milk-production, is greatly increased. It is also more suitable for feeding to young pigs.

Silage-making.

Silage is made in either a tower silo, a pit, or a stack. In other countries the tower silo has gained in favour over the older methods, due to the superior results obtained by its use. All the methods adopted aim at the one thing, and that is the exclusion of air from the mass. The processes going on are those of respiration, which is controlled by the amount of air admitted into the stack, fermentation, and bacterial activities, and, although not required, putrefaction in varying degrees. The process of fermentation, which is the chief, is controlled by the combined action of all the factors. A stage of temperature is reached which is too high, and therefore inhibits the process, and also the products of fermentation itself and the bacteria, reaching a degree of concentration which checks further development. The bacteria which are in the crops at this time split up the carbohydrates into oxygen, and reduce the sugars to organic acids, of which acetic is the chief, and also lactic. It is for this reason that leguminous crops do not make the best ensilage; they do not possess sufficient carbohydrates, and so there is a shortage of lactic acid. This, combined with protein putrefaction, produces a bad-smelling, unattractive food. Leguminous crops should always be ensiled with a starchy crop. The height to which the temperature is allowed to rise is also important, and this depends on the amount of air which is left in the crop when stacked. The wetter the crop, and the more tightly it is packed, the less air will be present in the stack. When the crop is tightly compressed the temperature remains low, and if much air is admitted the temperature will rise accordingly, to the extent of charing even. The various types of silage made depend on this control of temperature.

So far as these notes are concerned, it will suffice to say that more air, and therefore higher temperature, results in silage of the sweet type, while less air and lower temperature gives the sour type. There are all the degrees existing between these two; in a tower silo the full range is usually to be found.

Types of Silo.

By far the most economical and satisfactory silo is the cylindrical type. It may be constructed of various materials, such as reinforced concrete, brick, wood, and sometimes steel. By using this type the ensiled material is ensured of having plenty of pressure, except towards the top. This excludes the air, and so produces a sour silage, which is the most nutritive because less amounts of carbohydrates are utilized in its making. For the clamp and pit silo the driest area available is selected, and an excavation cut about 5 ft. deep, about 15 ft. wide, and as long as is needed. The fodder to be ensiled is never cut as in the tower silo, but simply flung into the bottom of the clamp and well tramped down. It is customary, once it has reached a sufficient height, to pull the carts over it to further compress it. The clamp is closed by covering over with turfs and earth. There may be a fair amount of loss by this method, due to water at the bottom of the clamp. The hillside silo, which is coming into increasing use in this country, is an adaptation of the clamp and pit style. The stack method of silage-making, although so far the most commonly employed in New Zealand,

is for several reasons the least satisfactory, and should really be regarded as only suitable for emergency work.

Feeding Silage.

In order to obtain the best results from feeding silage it is much preferable to use it as a substitute for roots instead of as a fodder (such as hay). It is really a succulent food containing a great amount of nutriment in a very digestible condition. Although that is so, it must also be remembered that a comparison between roots and silage from a chemical point of view shows the silage to have a far higher dry-matter content, and in this respect the diets are not interchangeable. But all that need be done to overcome this is to reduce the amount of fodder allowed when silage is being substituted for roots. From experiment it has been found that a 40 lb. ration of swedes may be substituted advantageously by a silage ration of 24 lb. when the silage is made of oats and mixed legumes.

The feeding use of silage is simple, and is advantageous to all stock except pigs. Cattle will consume 20 lb. to 30 lb. a day, and horses up to about 14 lb. a day. Calves can masticate it early, but it should not be fed to them under weaning-age. Bulls should only receive limited quantities, as it is liable to make them paunchy and slow at breeding. Good silage will not taint milk, but it should be fed after milking.

HAY.

A very large number of grasses and clovers, and sometimes oats combined with legumes, are used in the making of hay, and just as the composition of the mixture of grasses varies from field to field and farm to farm, so does the feeding-value of the resulting hay. The better the making of the hay the better will its feeding-value be. Clovers and lucerne are specially valuable owing to their high percentage of protein, but both these hays require very skilful handling, or a great proportion of their fine leaves will be lost, and it is in them that the feeding-value lies.

Haymaking should take place when the greater part of the field is in flower. It is a loss to cut too early, for the total cut would be reduced, but from a feeding point of view it is better to cut early than late. One cannot wait till the whole field is in flower or has flowered, for by that time the nutriment would have passed out of the hay and left it almost like straw. The Danish Agricultural School at Maesgaards, experimenting with clover hay, found that 200 lb. of early-cut hay produced 16¼ lb. more milk than did an equal quantity of hay from the same crop cut later. It was also found to be better for calves.

Although it has been said that the best time to cut hay is when most of the herbage is in flower, discretion must be used according to the weather conditions. That does not mean, of course, that where a hay crop is ready to cut, say, before Christmas, the work should be deferred until after New Year. That would be postponing the operation too long; yet it is a very frequent occurrence. Haymaking has perhaps always been done after New Year, and it would seem that numbers of farmers are determined that it will so remain. Speaking

generally, a great deal of the feeding-value of much of the hay in New Zealand is lost because it is cut long after seeding. In this condition it is little better than straw.

Once the cutting has started, provided the weather remains favourable, the hay should be handled as little and as gently as possible, and the process completed by stacking at the earliest possible moment. If it is stacked too early, due to improper drying, owing to, say, too thick a swath for the prevailing weather, the hay will "sweat" badly in the stack, and become brown in colour and have a not unpleasant odour. Provided that this does not go too far, the food value of the hay still remains good.

Of the common hays, rye-grass and clover is one of the best for milk-production, being generally higher in protein than the other mixed hays. In those districts where timothy hay is grown it is good practice to add clover to the timothy, the addition of the protein from the clover proving very beneficial. Timothy hay alone is much favoured by horses. It suits their taste, and they always do well on a feed or foddering of timothy. This grass as hay, even when cut after seeding, retains a very high feeding-value, so that although it has run to seed it is still of considerable value for horse-fodder or for making into horse-chop. Hay crops made from oats combined with peas, beans, tares, and vetches are very suitable for dairy cows.

The nutritive value of hays varies greatly, as would be expected. The value depends on the grasses going to make the hay, the condition in which it was made, the age of the pasture, and its treatment as regards manuring. Old pasture which has received little or no attention and has been practically unmanured is almost sure to be deficient in mineral matter. Where two cuts of hay are procurable in the season the second cut is the best from the nutritive point of view. It sometimes happens with lucerne that the second cut is made into silage, but it is better from the feeding point of view to make the first cut into ensilage and the second cut into hay.

On the farm the feeding of hay should be made the basis of the rationing of the stock, according to the quality and quantity available. One important point to be observed is care in the change of diet, especially with horses. New hay appears to be very indigestible for horses at first, for if carelessly fed it nearly always causes indigestion, colic, and not infrequently impaction of the bowels, which is a serious condition. "Broken-winded" horses should always receive their hay chopped and damp. Mouldy hay, such as is found in stack-bottoms, should not be fed to stock; it is dangerous, and more so if it becomes wet. Many a cow has been lost through feeding wet, mouldy hay. It is as well to add that salt or molasses water does not improve it in any way. Treated in this way it may be eaten more readily, but it is no less dangerous.

Hay is an important source of minerals for dairy cows in winter and spring, its value being determined, of course, by its quality. Where hay is fed as the sole roughage a dairy cow may be fed up to 20 lb. per day, and even over; where fed with roots or silage, 16 lb. to 10 lb. respectively, or slightly over; and where fed with straw and a succulent food it may be reduced to a daily ration of 5 lb. to 10 lb.

STRAW.

Straw is what remains after the seeds of a plant have been removed after ripening. The value of straw is very variable—much more variable, in fact, than that of hay. It is for this reason that some individuals maintain that straw has a good feeding-value—it varies so considerably in different farms. There is one aspect in which straw is always deficient, and that is its mineral value. It shows a high percentage of mineral, but this is chiefly silica, a substance of no feeding-value. Calcium and phosphates are deficient. It would not be prudent to advise the feeding of straw for any other purpose than merely to add bulk, except in the case of some samples of oat straw. Oat straw, especially of the older varieties, such as Tam Finlay, has a considerable feeding-value, but the other straws have practically none. Good samples of oat straw can be fed to horses, but only those doing slow work.

For dairy cattle oat straw is the only kind suitable for feeding to cows, but it only attains its highest feeding-value when fed together with a liberal allowance of roots. If it is to substitute hay in any quantity, then it must be augmented by feeding some concentrated food, such as bean-meal or linseed. This necessary addition practically rules it out of use, except for feeding to beef stock in favoured areas and to stores generally.

OATS.

Of the farm-grown grains, oats are by far the most popular for feeding purposes. The oat-sample should be plump and firm and have a bright and clear colour, as a dull colour indicates weathering. A good sample is always heavy for its bulk, but in this particular New Zealand has nothing to fear, generally speaking.

Oats stand alone for the feeding of horses. What it is that makes the oat protein of such value we have yet to learn. Oats have a great effect on the horse, and this can only be attributed to their being a well-balanced grain. The amount to be fed varies greatly with the kind of horse and the amount of work to be done. For hard-working horses an ordinary allowance would be about 20 lb. per day.

As a home-grown grain oats should commonly form part of the food for the dairy cow. It is one of the most economical sources of energy available, and when balanced with a food of higher protein content, such as beans, peas, &c., should form a considerable portion of the ration. The older varieties, such as Potato, Sandy, and Tam Finlay, have a higher feeding-value than some of the later varieties. No better grain than oats exists for milk-producing cows, and the only limit to their use is economy. Even when the price is high they are better retained on the farm and fed in preference to selling. Whenever possible they should be given to high-producing cows and those in pregnancy or poor in condition. They are a very safe food and palatable. They are better crushed when fed to stock.

For fattening stock oats are also good, especially for sheep. Lambs do extremely well on their mothers when these are fed on a little oats. With fattening cattle oats should not be too liberally fed, for if the feeding of the oats is stopped the animals will go off for a bit.

For calves, the feeding of oats is preferred when ground up and fed as oatmeal. Oatmeal and skim-milk will practically nourish a calf

as well as whole milk. Some claim that equally good results in calf-feeding are obtained with crushed oats. With pigs, there is rather too much fibre in the oat for their system of digestion and the age at which they are usually fed. If a portion of the husk is removed, however, oats are quite suitable.

WHEAT.

The only wheat available for feeding is that badly weathered or unsuitable for milling. It has a greater feeding-value than oats, but should never be fed finely ground, for it then forms an indigestible pasty mass in the digestive tract. For the same reason wheat should never be fed alone. Provided it is used with other foodstuffs and in small quantity it may be fed to cattle and pigs, but it is unsuitable for horses, as it causes skin trouble and even laminites (founder of the feet). It is the popular feed for poultry, and also forms the basis of most commercial mixtures for this purpose.

Wheat Offals.

Bran is the most valuable of the wheat by-products, especially for dairy cows. It is chemically better than oats in feed value, but practically about 1½ lb. of bran is required to equal 1 lb. of oats. Bran is rich in phosphorus and magnesium, but poor in lime (an important point to remember when feeding to dairy cows). Bran is an extremely palatable feed, and has a laxative and cooling effect on the digestive system. It is frequently too high in price for its value, but even then a little of it fed before and after calving of dairy cows is very beneficial, and also to high producers that may be receiving other rations. If roots are scarce, bran should be in use. Bran is fed to horses chiefly with the idea of preventing bolting of the grain feed, and for its laxative effect when used damp. Dry feeding of bran has a binding effect. The maximum ration of bran per day for horses and cattle should not exceed 3 lb. For pigs bran is not suitable, as it is far too fibrous and causes digestive troubles; the finer offals are more suited. If bran is fed to young stock it ought, owing to its deficiency in lime, to be used in conjunction with some leguminous foods such as beans or peas, preferably in the form of meal. Pollard is a very suitable food for pigs, but care should be exercised in buying, for it is very subject to adulteration.

When feeding the finer wheat offals to young pigs (for which they are quite suitable) their deficiency in lime is corrected by the use of skim-milk or buttermilk, but not whey. The finer offals are quite suitable for young pigs at weaning-time. The deficiency in lime may also be made good by feeding fish-meal or steamed boneflour. Pollards and middlings are unsuitable for dairy cattle. They are unpalatable to them, and cause digestive troubles, and are also uneconomical.

BARLEY.

In feeding barley its value may be regarded as better than that of oats, but not so good as maize; it is about similar to wheat. Barley is quite suitable food for horses, cattle, and pigs.

Barley-meal is used chiefly in the feeding of pigs. Some authorities contend that it is essential to the production of a first-class pork or

bacon. Provided the price is right, this contention may be accepted, but only then. Good pork can be produced by other foods also. The blind use of barley-meal is not to be advocated.

MAIZE.

Maize, with the exception of polished rice, is the greatest source of energy among all the cereals. It is essentially a carbonaceous food, containing approximately 70 per cent. of carbohydrates. It is low in protein and very poor in ash. It is palatable and readily eaten by all stock. Poultrymen prefer the flint variety. The grain, when fed, is very liable to form a doughy mass in the stomach if not combined with fibrous food. Fed in too great quantities it causes skin-eruptions. Maize is a very unbalanced food in many ways, and so should always be fed as part of a mixed diet. It is mostly used here for pig-feeding, and when comprising over 65 per cent. of the ration it is very liable to produce a soft carcass with a rather unpleasant flavour. Flaked maize is more digestible for pigs than raw maize. Maize provides many very useful and valuable feeding by-products, but so far they are of little interest in this country.

BEANS AND PEAS.

All leguminous seeds occupy a place of their own in the list of popular home-grown foodstuffs. Beans constitute a very valuable feed for dairy cows. They are usually fed to cattle and pigs in the ground state. In comparison with cereals they contain two to three times as much protein. For this reason beans are a very stimulating food, especially for milking-cows, which are greatly influenced to higher production by this food. The feeding of new beans should be avoided, as they are very liable to cause indigestion; with care and rational feeding no ill results should follow. Beans are fed to horses, cattle, sheep, and pigs. The amount suitable for a horse varies according to the work which he is being called upon to do, but when they are the chief nitrogenous food 1 lb. to 3 lb., or even a little more, may be fed daily. Beans should never be fed whole.

Bean-meal is fed in considerable quantities in most dairying countries, but the practice of making it the only form of concentrates given is falling into disuse. It should be fed with more bulky foods, and when used in this way 4 lb. to 5 lb. will be a liberal allowance. Bean-meal very quickly deteriorates. Maize is greatly benefited from a feeding aspect by the addition of beans or bean-meal.

Peas are very similar to beans as a food. Peas and beans both have a tendency to make hard white butter, but only when fed in quantity. Pea-meal is fed similarly to bean-meal. New Zealand is well suited for the production of peas and beans, and one wonders why they are so comparatively little used by our dairy-farmers.

TREACLE OR MOLASSES.

This is a valuable foodstuff at times, if it can be procured at a reasonable price. It is essentially a carbohydrate food. It is palatable, appetizing, and laxative, but its only value really lies in making what would otherwise be unpalatable foods palatable—some qualities of hay, for example. It is a common constituent in proprietary stock-foods.

MEAT-MEAL.

Meat-meal was originally a by-product from the manufacture of meat-extract, and still is so; but with quite a considerable quantity of that now put on the market the meat has been passed through a digester and the fat extracted. A small proportion of finely divided bone is not objected to.

This type of food is very rich in protein and poor in carbohydrates. That means that it will be a very suitable food for all young growing stock as a flesh-former, and to any other stock whose functions cause a large demand to be made on the proteins or flesh of the body, such as deep-milking dairy cows, heavy draught horses, and racehorses. For young pigs it forms a very satisfactory adjunct to the diet.

Meat-meal is eaten by all types of stock, but it is advisable to introduce it gradually into the ration of dairy cows and horses. Used properly—that is, not in excess of requirements—10 per cent. of the total ration for young pigs, and 3 lb. to 4 lb. per day for dairy cattle—it gives a very satisfactory return, and the health of the animals fed with it is generally very much improved, resulting in greater economical production. There is no reason why the better grades of meat-meal should not be used, especially for pigs.

FISH-MEAL.

Fish-meal is a food which has come more or less into prominence recently, and consequently we hear a great deal about it—some reports being wellnigh on the verge of the phenomenal. It is very rich in protein, and also in minerals—chiefly lime and phosphate. No other type than the white fish-meal should ever be fed to stock, and then only if no more than 4 per cent. of salt be present. It is through the use of the inferior grade—owing to its tainting the flesh and occasioning serious losses—that fish-meal fell into disrepute. The second grade is only fit for manure. Recent tests on the feeding of white fish-meal have proved conclusively that it will not taint either milk, flesh, pork, or eggs. To be on the safe side the feeding may stop fourteen days or more before killing. The finest grades, however, can be fed right up to killing without causing taint. Cheap fish-meal should never be bought.

The composition of fish-meal makes it most suitable for the feeding of all young stock, and also for all breeding-stock. It is very suitable for pig-feeding. Its feeding-value is most marked when fed along with farm cereal grains, because it possesses an abundance of the elements comparatively lacking in such grain—mainly protein and mineral matter. As regards the quantity to be fed, although 2 lb. could be given to a dairy cow, the price would make it uneconomic. An amount equal to 5 per cent. of the ration will suit in most cases. With pigs no more should be fed than 10 per cent. of the total ration, or at most ½ lb. per day to adults.

WHALE-MEAT.

This product has only recently been marketed as a food for animals. For pig-feeding whale-meat has proved very satisfactory, and is believed to be superior to fish-meal. It is said to cause no taint, and the fat of the carcass is firm and of good colour.

THE BLACKBERRY PEST.

III. CONTROL—*continued.*

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(2) BIOLOGICAL CONTROL: INSECTS AND FUNGI.

THE possibilities of biological control in connection with the blackberry pest were taken into active consideration by the Department of Agriculture several years ago, and various local investigations were made. In 1924–25 as complete a study as possible on insect and fungous parasites attacking the genus *Rubus* in all parts of the world was undertaken, entomological and mycological authorities in many countries being communicated with. Some results of local work, and an account of the wider investigation, including the part taken by the Cawthron Institute, will now be given.

Parasites attacking Blackberry in New Zealand.

There are already in New Zealand a number of insects and fungi attacking blackberry to a greater or lesser degree. Occasionally one notices in newspapers statements concerning large areas of blackberry which are being "completely killed out" by some fungus. On investigation, however, there is, as a rule, not much foundation for such reports beyond the fact that a few patches in a large area are badly infected, having their canes partly or entirely withered, but without evidence that the plants would not send up fresh shoots in the following year. Unfortunately, this is practically always the case; the vines are killed for a season, and twelve months later the plant is as healthy as ever; only very occasionally is a small plant completely killed.

One of the most important of the fungi attacking blackberry is *Leptosphaeria Coniothyrium*—raspberry, unfortunately, being also parasitized by this fungus. In the life-history of *Leptosphaeria* there are two stages, and of these it is the conidial stage which does all the damage. This stage has been named *Coniothyrium Fuckelii* Sacc., and it is more severe on raspberries than blackberries. Infection is effected by means of a spore which germinates and penetrates the epidermis, underneath which a mass of hyphæ is soon formed. These very quickly penetrate to all parts, including the conducting system of the stem. Here they develop to such an extent, and so rapidly, that in a very short time the vessels are entirely blocked, and as a result the stem dies above the point of infection. Though this disease in some localities, and in some seasons, gives the appearance of having caused the death of many blackberry-bushes, or having prevented the ripening of the fruit on others, actually the real damage does not amount to very much, for its ravages are far too spasmodic; it is severe in a locality during one season, then next season practically non-existent. The disease is much more vigorous on raspberry.

The most interesting of these reports came from Feilding, and on investigation it was found that the suffering blackberry was situated on the banks of a stream and on the flat low-lying adjacent land.

Here the weed was found to be attacked by a number of parasites, the following being the most evident :—

(1) Rose scale (*Aulacaspis Rosæ*) : This insect was conspicuously abundant on the more sheltered stems, and has been reported from several other localities in New Zealand, but it does no more than restrict the growth of the infected plant.

(2) Bronze beetle (*Eucalaspis brunneus*) : This had caused a considerable amount of damage to most of the leaves, but it does little real harm to the plant.

(3) Leaf-tying caterpillar (*Tortrix excessana*) : This was present only to a very slight extent.

(4) Cane-wilt (*Leptosphaeria Coniothyrium*) : This fungus was more or less abundant. In other parts of New Zealand it has been found to weaken the plant. Here it was common on the long terminals, and was probably the cause of so many of these tips withering.

(5) Leaf-spot (*Septoria rubi*) : This was also very much in evidence, but not causing any damage. It is common wherever blackberry is found, and produces no more serious damage than a spotting of the leaves.

(6) Tip-wilt : The cause of this is unknown, and it is far from common, this particular area having it more in evidence than any I have ever seen. The manner in which the fruiting shoots are attacked is quite striking, and in some cases the wilt extends for 1 ft. or more down the shoot. It causes a premature withering of the developing fruit, which as a rule remains on the stalks in a dried condition. The fungi found in association with these diseased fruiting shoots are so weakly parasitic that at present they are not regarded as being the cause of the wilt.

This flat land, according to the owner, had not been flooded ; but it was evident from the silt on the old leaves of the bushes growing along the banks of the stream that they had been submerged, and here there was no sign of the " tip-wilt." On a later visit to this area the spring was well advanced, and it was very evident that the flooded creek-side bushes were greatly in advance and in a much more healthy condition than those on the flat, in spite of the fact that they had been subjected to a somewhat lengthy submergence during the winter and early spring.

At this visit it was noticed that there was something attacking the young shoots here and there, and this proved to be a stem-boring insect known as *Œcophora pseudo-prutella*, which itself is so heavily parasitized that it is not likely to do very much harm. Even in this locality it was not in great abundance. It seems that the parasite doing the greatest amount of damage is rose scale ; but this, as in the case of *Leptosphaeria*, only attacked the vines which were considerably advanced—there being no evidence of infection on the younger stems —though on all the old stems from the crowns to the terminals there was dense covering of *Leptosphaeria*, while only the protected stems low down near the crowns were infected with rose scale.

SURVEY OF BLACKBERRY AREAS.

As complete a survey as possible of all the blackberry areas in the North Island and a few parts of the South was made, and in this

I paid special attention to parasites attacking blackberry under the following conditions :—

Permanent swamp.	Hill country.
Temporary swamp-lands.	Roadside.
Flooded areas.	Plantations (well shaded).
Flat well-drained lands.	

Each of these will be considered separately.

Permanent Swamp.

Blackberry growing in areas of this nature was examined at Te Awamutu, Reweti, Woodhill, Kaukapakapa, Opotiki, and Wairoa. In none of these areas was tip-wilt visible, and the only parasites in evidence were bronze beetle (Fig. 26) and cane-wilt, both of which were abundant, while the plants were most healthy.

Temporary Swamp-lands.

These were examined at the following places : Te Awamutu, Ohaupo, Frankton (Waikato), Taupaki, Kaukapakapa, Maungaturoto, Hikurangi, Otiria, Tauranga, Opotiki, Wairoa, Tangoio, and Puketitiri. The only parasites found were the same as in permanent swamps, there being no sign of any borer or tip-wilt of the fruiting shoots.

Flooded Areas.

Plants growing on areas which had been flooded under very silty conditions were examined at the following places : Te Awamutu, Ngaruawahia, Mercer, Waimauku, Reweti, and Opotiki. Again the same two parasites were in great evidence, but the leaf-eaters (bronze beetle) had done far less damage. There was no sign of tip-wilt, and though in some cases—for instance, at Te Awamutu—the plants had been flooded (a process which seems of yearly occurrence here) just previous to the time of flowering, and all the stems and leaves had been thickly coated with a pure silt, flowering was general, and growth particularly dense and luxuriant. Farmers I talked with on the subject of flooding were most emphatic that long periods of flooding did not in any way damage the plant, even though the waters might leave large quantities of silt covering stems and all green parts; in fact, the bushes in every case seemed even more vigorous than under normal conditions. This is certainly what I found to be the case.

Flat well-drained Land.

Many areas of this class of country were visited, among others Te Awamutu, Hamilton, Taupiri, Huntly, and Auckland ; and many places in North Auckland, including Henderson, Swanson, Waitakere, Helensville, Whangarei, and Otiria ; other visits were made to Tauranga, Clive, Whakatane, Opotiki, Wairoa, Esk Valley, and Tangoio. Here again cane-wilt and bronze beetle were everywhere much in evidence. In addition, rose scale was present at Opotiki, Hamilton, and Auckland, while the rust *Kuehneola albida* was noticed to a small extent at Opotiki and Tangoio. This causes the wilting of shoots, sometimes as far as the crowns in some seasons in varied localities, but even in dense masses there is no general attack—only a few scattered stems here and there being infected. Another parasite in evidence to a small extent in Auckland, Waitakere, Otiria, Opotiki, and the Esk Valley was leaf-spot, a parasite which does little or no damage.

FIG. 26. SPECIMENS OF RUBUS FRUTICOSUS, SHOWING DAMAGE TO LEAVES BY BRONZE BEETLE.

FIG. 27. RIPE BLACKBERRY FRUIT, SHOWING ATTACK BY FUNGUS WHICH DESTROYS FLESHY PART BUT LEAVES SEED UNDAMAGED.

[*Photos by H. Drake.*

Hill Country.

Blackberry growing on hill country was examined at Ngaruawahia, Waitakere, Kaukapakapa, Otiria, Wairoa, Opoutama, Mohaka, Tangoio, Esk Valley, and Puketitiri. In these places cane-wilt was everywhere abundant, as also was evidence of bronze beetle, but this was much more evident on the less exposed parts. Rose scale was in evidence at Opoutama and the Esk Valley, the rust *Kuehueola albida* was found at Tangoio, while leaf-spot was fairly common at Waitakere, Otiria, Esk Valley, Puketitiri, and Napier.

Roadside.

Roadside blackberry was very much in evidence in almost every town I visited, being particularly noticeable in Auckland, Wairoa, and northern Hawke's Bay generally. Here again the two persistent parasites, cane-wilt and bronze beetle, were by far the most abundant, with the addition in Auckland of rose scale and at Napier of rust. Here another factor comes in—the effect of dust. In many places the plants were very densely covered with dust, which in no way seemed to inhibit the vigorous growth of the plant or the flowering, the dust-covered bushes being just as healthy as the clean ones.

Plantations well shaded.

Plants growing in the bush were examined at Auckland, Glen Eden, Tangoio, and Patoka. The evidence of bronze beetle was slight, but cane-wilt was general. At Tangoio silver-leaf fungus (*Stereum purpureum*) was quite abundant, but doing no apparent harm.

BLACKBERRY PARASITES RECORDED.

In the North Island blackberry parasites have been recorded as follows :—

Taranaki—
Longhorn beetle (at Midhirst).
Rhizopus arrhizus.
Leptosphaeria Coniothyrium (cane-wilt).
Aulacaspis Rosæ (rose scale).

Thames—
Kuehueola albida (rust).

Waihi—
Leptosphaeria Coniothyrium.

Hastings—
Rosellinia radiciperda.

From the South Island :—

Picton—
Carposnia adroptella (blackberry-seed moth)
Chenochilon perforatus (scale insect).

Blenheim—
Stereum purpureum (silver-leaf).

Nelson—
Leptosphæria Coniothyrium.

Tasman—
Aulacaspis Rosæ.

Hokitika—
Aulacaspis Rosæ.

Christchurch—
Aulacaspis Rosæ.

In no case were the bushes observed to be suffering in any way from these parasites.

SUMMARY.

To summarize, the following insects and fungi have been found to attack blackberry in various parts of New Zealand :—

Rose scale (*Aulacaspis Rosæ*).
Bronze beetle (*Eucalaspis brunneus*).
Leaf-tying caterpillar (*Tortrix excessana*).
Cane-wilt (*Leptosphaeria Coniothyrium*).
Leaf-spot (*Septoria Rubi*).
Stem-borer (*Œcophora pseudo-prutella*).

Rust (*Kuehneola albida*).	*Rhizopus arrhizus.*
Tip-wilt.	*Rosellinia radicipersa.*
Silver-leaf (*Stereum purpureum*).	Bud moth (*Carposina adroptella*).
Longhorn beetle.	Scale insect (*Chenochiton perforatus*).

None of these is found to be harmful to any great extent, and even where a plant is attacked by two or three of the parasites the damage is only very slight.

Parasites in England and France.

After insect and fungous parasites infesting blackberry in New Zealand had been investigated and none found to damage the plant to any extent, entomologists and mycologists in many countries abroad were circularized with a view to finding the parasites attacking blackberry and related plants throughout the world and to ascertaining if any could be utilized to combat the pest in New Zealand. Replies were received from over forty entomologists and mycologists, but from none was any information received concerning parasites which would be sufficiently effective to warrant their introduction.

In June, 1925, an entomologist connected with the Department of Agriculture (Dr. J. G. Myers) was abroad, and he was communicated with and asked to inquire into the matter of insect parasites as a means of controlling blackberry. He found that the natural enemies of blackberry in Europe are less conspicuous than those in New Zealand. They were studied in Suffolk and Kent, and again in France at Versailles. The information then available was practically negligible, and concerned usually only those raspberry pests of which blackberry is the original host. No root-attacking species were found. Insects affecting the rest of the plant included a few Lepidoptera (largely polyphagous), the raspberry-beetle (*Byturus tomentosus*), some Typhlocybid leaf-hoppers, a species of thrips, and certain gall-forming Cynipids and Cecidomyiids

Taking the foregoing in detail, we may first reject the Lepidoptera (butterflies and moths) as insignificant. Practically only the leaves are attacked, and the damage to the plant is small.

The raspberry-beetle, as a larva, attacks the fruit and renders it more or less unpalatable, but does not injure the seed. It is one of the worst pests of raspberry in England, and the adult beetles attack apple-blossoms and other flowers in early spring. Dr. D. A. Imms, of Rothamsted, while admitting the practical certainty that it would also attack our raspberries, thought that the question of introducing this beetle might be considered.

Several species of Typhlocybid leaf-hoppers live on the under-surface of the leaves, causing spotting and yellowing, as in the case of the species found at Wairoa, Hawke's Bay, and mentioned elsewhere. The damage as seen in Europe is more or less negligible, but Typhlocybids can become very destructive at times.

A thrips species causes a certain amount of castration by " blighting " the flowers.

There remain the gall-makers—forms which are likely to be more specific and thus safer than any of the preceding. There are three Cecidomyiidae and one Cynipid. Of these four forms three concentrate on the vegetative parts, while the fourth attacks the reproductive

organs. The Cynipid *Diastrophus rubi* Hartig produces galls in the shape of swellings on the stem. Similar damage is committed by the Cecidomyiid *Lasioptera rubi* Heeger, a gall-former which attacks raspberry and blackberry. It is parasitized heavily by several Hymenoptera (ants, bees, &c.). Concerning this insect Dr. R. J. Tillyard says, "As far as I can find out, these galls rather tend to stimulate than check the growth of the plant, the insect acting as a natural pruner."

Perrisia plicatrix H. Low is a midge whose larvae roll and twist the young leaves. It has never been recorded from raspberry. There are several broods each year.

Contarinia rubicola Rubsamen in the larval stage does the same damage as thrips, destroying the stamens in the young flowers. It has been recorded once from raspberry in Germany, but is not known to attack it in England. To quote from Dr. Myers: "If any insect enemies were introduced against blackberry the Cecidomyiids, especially *Perrisia* and *Contarinia* by reason of their specificity, would be the most promising. At the worst they might attack nothing more than raspberry, and at the best they might make some impression on the blackberry pest. Plant control by means of natural enemies is, however, a very dubious matter and one in which the utmost circumspection should be used."

However, if proper precautions are taken as regards transport, and later in testing, there should be no objection to the introduction of possible enemies of the pest. When the experimental work was commenced it would have been very unwise to introduce parasites into the Dominion, as there were not the necessary insectaries for the proper confining of the insects under strictly experimental conditions, and consequently the risk would have been far too great. At the present time we are in a very different position, since the Cawthron Institute, at the instigation of Dr. Tillyard, has been provided with large, well-equipped insectaries where parasites can be thoroughly tested without fear of accident. Any parasite now introduced into New Zealand is tested under the most rigid conditions, and it is determined definitely to what extent the insect will parasitize plants of economic importance.

Natural Enemies in other Countries.

The result of correspondence with entomologists and mycologists overseas was far from hopeful. The following list of parasites, compiled from these replies, gives the insects and fungi attacking the genus *Rubus* in all parts of the world:—

(1) FUNGOUS PARASITES.

Norway.

Gymnoconia peckiana.
Phragmidium rubi-idaei.
Phragmidium violaceum.
Phragmidium rubi.
Phragmidium rubi var. canicanti.
Phragmidium perforans.
Kuehneola albida.
Pucciniastrum arcticum.
Sphaerotheca humuli.
Coleroa chaetomium.
Leptosphaeria Coniothryium.
Didymella applanata.
Plectodiscella veneta.
Septoria rubi.
Peronospora rubi.

Italy.

Septoria rubi.

Egypt.

No record.

India.

Cercospora rubi.
Phragmidium Barclayi.
Hamaspora longissima.
Septoria rubi.
Phragmidium orientale.

Phragmidium rubi.
Phragmidium assamense.
Phragmidium incompletum.
Phragmidium burmanicum.

Ceylon.

Phragmidium sp.

Uredo.

South Africa.

Phragmidium sp.

Cronartium sp.

Australia.

VICTORIA.

No record.

SOUTH AUSTRALIA.

Septoria rubi.
Phragmidium barnardi.

Phragmidium subcorticium.

WESTERN AUSTRALIA.

No record.

NEW SOUTH WALES.

No record.

Canada.

SASKATCHEWAN.

Phragmidium imitans.
Gymnoconia peckiana.

Septoria.
Mosaic.

OTTAWA.

Septoria rubi.
Phytomonas tumefaciens.

Leptosphaeria Coniothryium.

United States of America.

NORTH CAROLINA.

Gymnoconia peckiana (Howe) Trotter.
Septoria rubi.
Cercospora rubi.

Fusarium rubi.
Gymnoconia peckiana.

NEW YORK.

Plectodiscella veneta.
Verticillium sp.

Mosaic.

MICHIGAN.

Gymnoconia peckiana.

Plectodiscella veneta.

KANSAS.

Septoria sp.

KENTUCKY.

Mosaic.

MINNESOTA.

Gymnoconia peckiana.
Kunkelia sp.
Microsphaerella rubina.
Leptosphaeria Coniothyrium.
Septoria rubi.

Plectodiscella veneta.
Phytomonas tumefaciens.
Mosaic.
Leaf-curl.

CALIFORNIA.

Gymnoconia peckiana.
Septoria rubi.

Phytomonas tumefaciens.
Botrytis sp.

WASHINGTON.

Gymnoconia peckiana. *Armillaria mellea.*

Jamaica.
No record.

Hawaii.
No record.

Trinidad.
No record.

Fiji.
No record.

Regarding fungous parasites, Dr. C. K. Shear, of the United States Department of Agriculture, Washington, stated :—

In so far as we are aware little or no practical success has ever been attained in destroying weeds by means of fungous parasites. We have no fungous parasites of *Rubus* sufficiently active to destroy any of our native or introduced species of *Rubus*. Of course, it is possible that some of these parasites might be more destructive in your country and on the species you are dealing with, but on the other hand it is possible, if not probable, that they might be less injurious to your species, and again if once introduced they might attack other species of *Rubus* or other plants which are of commercial value. It is very difficult to predict how any organism will behave when brought into contact with new hosts and a new environment, and in this case it seems to us possible, if not probable, that the danger would be greater than any benefit likely to be derived from the introduction of new parasites. Of course, it may be possible that there is some fungus which would be as destructive to your *Rubus* as the chestnut blight fungus is to our chestnuts, but I think the chances are small and the risks too great.

(2) INSECT PARASITES.

Italy.
No data.

Khartoum.
No data.

British Guiana.
No data.

India.
No data.

Barbadoes.
No data.

South Africa.
No data.

Cyprus.
No data.

Bermuda.
No data.

Hawaii.
No data.

Ceylon.
Natada Nararia (Fringed nettle grub).

Canada.

Byturus unicolor.
Oberea bimaculata.
Phorbia rubivora.
Synchlora aerata.
Monophadnus rubi.
Pamphilius fletcheri.
Prionus laticollis.
Bembecia marginata.
Œcanthus niveus.
Agrilus ruficollis.
Metallus rubi.
Synanthedon (Aegeria) rutilans.

United States (Washington State).

Agrilus ruficollis.
Oberea bimaculata.
Bembecia marginata.
Phorbia rubivora.
Hartigia abdominalis.
Monophadnus rubi.
Œcanthus nigricornis.
Tetranychus telarius.

Concerning the foregoing insects the following notes will be of interest :—

Byturus unicolor Say.—This is a small Dermentid beetle which feeds as a rule on the young leaves and buds of raspberry and blackberry. The larvæ feed on the mature fruit and sometimes cause a considerable amount of damage.

Oberea bimaculata Oliv. — The raspberry-cane borer, a slender, black Cerambycid beetle. The larval stage is spent burrowing in the raspberry-canes. It also has a fondness for roses to a limited extent, and each year is recorded as being very much in evidence.

Phorbia rubivora Coq.—The raspberry-cane maggot, a small greyish-black fly the larvæ of which tunnel in the raspberry-canes.

Synchlora aerata Fab.—The raspberry spanworm. The larvæ of this sometimes injure the fruit of raspberry and blackberry, but not to any great extent or to the extent of rendering the seed sterile.

Monophadnus rubi Harris.—The raspberry sawfly, whose larvæ work havoc on the foliage of raspberries and blackberries.

Pamphilius fletcheri Macq.—The raspberry web-worm, an insect which causes considerable destruction by webbing the terminal leaves together.

Prionus laticollis Drury.—The giant root-borer, one of the large long-horned beetles the larvæ of which bore into the roots of blackberry, grape, apple, and cherry. It may cause a considerable amount of damage, but favours too many hosts of economic importance to warrant a trial in this country.

Bembecia marginata Harris. — The blackberry-crown borer. The larvæ of this moth attack blackberries, timpleberries, and loganberries by boring into the roots and girdling them. In some places it becomes a very serious pest, and there seems every likelihood of it turning out a very useful parasite. Regarding this insect Dr. Tillyard says, "It can be controlled in raspberry by carefully cutting out the infested canes. Does not attack roses or any other plants. A vigorous insect of great potential value."

Œcanthus niveus DeG.—The snowy tree-cricket. Damage by this insect is done through the egg-punctures, but it is not of any great importance.

Agrilus ruficollis Fabr.—The red-necked agrilus. The larvæ of this attack blackberry, raspberry, and dewberry canes, causing gall-like swellings and at times doing a considerable amount of damage by killing the stems.

Concerning the insects listed from America attacking blackberry and raspberry, a very large range of orders is represented—*e.g.*, Coleoptera (beetles), Hymenoptera (ants and bees), Lepidoptera (butterflies and moths), Diptera (flies, mosquitoes, &c.), Hemiptera (cicada, aphids, lice), and Orthoptera (dragonflies, mayflies, earwigs). The most likely to do damage are *Agrilus ruficollis* and *Bembecia marginata* (both mentioned elsewhere). In the United States damage by these is not so very extensive on account of the vigorous control exercised against them, so it is impossible to say what damage they might cause if introduced into New Zealand where these control measures are absent. It is more than likely, however, that they would find blackberry a very palatable host.

Work of the Cawthron Institute.

In 1926 Dr. R. J. Tillyard, head of the biological branch of the Cawthron Institute, visited America and Europe, and took this opportunity to investigate fully the insect parasites of our noxious weeds, with the idea in particular of introducing into New Zealand those which seemed likely for the control of blackberry. Dr. Tillyard went on the understanding that permits for the introduction of parasites would be granted provided the following conditions, drawn up by the Department of Agriculture, were strictly adhered to :—

(1) No species to be forwarded from any country to New Zealand except such as are known to feed on species of the genus *Rubus* only.

(2) All shipments on arrival in New Zealand to be taken charge of by an officer of the Department of Agriculture, who shall examine the cages to see that they are intact, and that no insects can escape from them while being forwarded to Nelson. (This would allow of broken or damaged consignments being either destroyed or their cages repaired before forwarding.)

(3) Dr. Tillyard to furnish to the Director-General of Agriculture an account of the life-history of each species selected for study.

(4) The permits granted for introduction of all *Rubus*-feeding species to be permits restricting the study and rearing of such insects to closed insectaria and cages in the Cawthron Institute grounds and laboratories.

(5) All such insects to be thoroughly tested within such insectaria or cages on all important economic plants, particularly introduced Rosaceae, such as apples, pears, stone-fruits, roses, &c.

(6) If considered necessary similar tests to be made in country of origin before shipment.

Opinions regarding the introduction of fresh parasites differ very widely. Some people are strenuously opposed to importation under any circumstances. Others (generally those with large areas of blackberry) are clamouring for the Government to introduce any insect at all and set it free, no matter what the effect may be on the fruit industry so long as the blackberry will materially suffer. A third class consists of those who have given the matter much more mature and reasonable consideration, and consequently are willing that possible insect controllants should be very carefully studied in their natural habitat and an exhaustive investigation made concerning their range of hosts before they are introduced into this country; further, that with as full information at hand as possible the insects should be introduced under the strictest conditions of confinement in transport, and then kept under very rigid experimental conditions in specially constructed insectaries, where they may be tested on weed pests and also on all likely hosts of economic importance as laid down by the Department.

On his return Dr. Tillyard furnished a report in which he suggested that the following insects should be imported and studied, his remarks on the various species being given in abridged form :—

(1) *Insects which attack the Crown and Stem by boring or Gall-forming.*

Coroebus rubi Linn.—A Buprestid beetle which destroys up to 60 per cent. of the new stems in some seasons. Its larval attack on other members of the family is almost negligible. Only very occasionally does it attack the rose Frau Karl Druschki, while raspberry—the nearest relation of blackberry—is not parasitized at all.

Agrilus ruficollis Fabr.—A Buprestid beetle found in North America, which attacks blackberry, dewberry, and raspberry.

Bembecia marginata Hartis and *Bembecia hylaeiformis* Lasp.—The larvæ of these moths attack the crowns by the formation of galls. They will attack raspberry as well as blackberry.

(2) *Insects attacking Twigs.*

Diastrophus rubi Htg.—A small gall-forming Cynipid which favours the same hosts as *Agrilus ruficollis*.

(3) *Insects attacking Leaves and Shoots.*

Thyatira batis Linn.—Attacks both blackberry and raspberry. Its only damage is that caused by the larvæ feeding on the leaves.

Habrosyne derasa Linn.—Feeds, as in the case of the preceding, on both blackberry and raspberry, but only to a very slight extent on the latter.

Cidaria albicillata Linn.—Has a number of hosts, the most noticeable damage being the larval attack on the leaves.

Tischeria marginea H. W.—A leaf-miner which has been reported to attack blackberry and many other plants.

Notocelia uddmanniana Linn.—The larvæ of this cause rolling of the leaves of blackberry and raspberry.

Schreckensteinia festaliella Hb.—A leaf-feeding Tineoid.

Typhlocyba tenerrima H. S.—This small European leaf-hopper is not known to feed on any plant other than blackberry.

Monophadnoides rubi Harris.—A North American sawfly which attacks both blackberry and raspberry.

Metallus rubi Forbes.—Also a North American sawfly which mines the leaves of blackberry only.

(4) *Insects attacking Flowers and Fruit.*

"I have not been able to find any insect so far which is effective in these parts on the blackberry. Various species of *Byturus* attack the fleshy receptacle of the fruit of species of *Rubus*, but they all seem to prefer the raspberry to the blackberry, and in any case they do not prevent seeding, but only make the fruit unpleasant to eat.

"The Anthomyiid fly, *Phorbia rubivora* Coq., known in America as the raspberry-cane maggot, is very deadly on raspberries, and prefers them to blackberries. There may be other species of this genus which will only attack blackberry, but I have no record of them so far.

"The blackberry-fly, *Petrandrus rubivorus* Coq., found in South Africa, is stated to never attack raspberry or any other fruit."

Of the above species provisional permits were granted for the introduction of the following: *Coroebus rubi*, *Agrilus rubicollis*, *Bembecia marginata*, *Bembecia hylaeiformis*, *Diastrophus rubi*, *Thyatira batis*, *Tischeria marginea*, *Notocelia uddmanniana*, *Schreckensteinia festaliella*, *Typhlocyba tenerrima*, *Monophadnoides rubi*, and *Metallus rubi*.

Habrosyne derasa, *Cidaria albicillata*, and *Typhlocyba tenerrima* have been collected and left at Rothamsted, in England, for close study.

By March, 1927, eleven small insectaries, six being for this special work, were in commission at Cawthron Institute. They were very carefully constructed to ensure the proper and safe keeping of the insects for experimental work. Later in the same year Dr. Tillyard designed a new insectary, 50 ft. by 42·5 ft., costing about £2,000, and to be used mainly for work on blackberry. It was brought into use towards the end of the year. The whole scheme has been assisted by financial support from the Empire Marketing Board and the New Zealand Government.

METHODS OF TESTING PARASITES.

The three generally accepted methods for the proper testing of insects used for the control of noxious weeds are as follows: (1) Oviposition, (2) starvation tests, (3) preference tests. In the case of the insects introduced into New Zealand for the control of noxious weeds these three tests are being carefully carried out under the best and safest experimental conditions possible.

(1) *Oviposition Tests.*

Fertile females are tested in closed cages with portions of the plant on which oviposition is required, and it may be found that (*a*) oviposition takes place on the plant; (*b*) the insect refuses to oviposit on the plant, but oviposition takes place somewhere else in the cage; (*c*) the insect refuses to oviposit.

(2) *Starvation Tests.*

These tests are carried out on the larvæ and adults of all phytophagous insects, and consist of confining them with the plant alone; consequently they have to eat it or starve.

If in oviposition tests eggs have been laid on the plant, then these are allowed to hatch *in situ*; if they are not fertile, then fertile eggs are placed on the plant. Where the larvæ and not the eggs are being used for transference they are selected from their natural food plant and placed on the plant under investigation, the insects being tested in the four following stages: (*a*) First larval instar, newly hatched; (*b*) half-grown larvæ; (*c*) beginning of last larval instar; (*d*) imago when necessary.

These tests may result in any of the following: (*a*) Feeding on the plant; (*b*) feeding, but without vigorous attack; (*c*) feeding, followed by death; (*d*) refusal to feed and consequent starvation.

(3) *Preference Tests.*

These are used to show to what extent an insect favours a certain plant. Under starvation tests it is determined whether the insect is positive or negative to a large number of closely related plants, while under preference tests the degree to which each of these plants may be parasitized in the presence of others is readily determined. For instance, blackberry may be the natural food plant of a certain insect, but it is necessary to determine to what extent loganberry may be parasitized. A number of insects are placed on loganberry which has been proved positive, and then blackberry is introduced into the same cage. The following results may be obtained: The insects may persist on loganberry and not attack blackberry at all; a certain number may go over to blackberry, the rest remaining on loganberry; or they may all leave loganberry and commence feeding on blackberry.

PARASITES RECEIVED AND RECENT OPERATIONS.

Early in 1927 the following insects were received for the Institute: (1) *Thyatira batis* Linn., (2) *Agrilus ruficollis* Fabr., (3) *Bembecia marginata* Harris, (4) *Coroebus rubi* Linn.

Seventy-eight pupæ of *Thyatira batis* were received, and fifty-two of these emerged, twenty-two being males and thirty females. The moths were placed in egg-laying cages, and 340 larvæ resulted. These, on account of very heavy mortality and starvation tests, were reduced to sixty-four. The starvation tests showed that they were positive towards raspberry and loganberry, but negative to strawberry. Preference tests were also carried out, resulting in the following: (*a*) Raspberry *versus* blackberry—All larvæ returned to blackberry, showing a very strong preference for it. (*b*) Loganberry *versus* blackberry—The larvæ again returned to blackberry.

Dr. L. D. Howard, of Washington, sent blackberry-canes with *Agrilus ruficollis* and *Bembecia marginata*. All the canes did not grow; those which survived showed two specimens of *Agrilus*, which commenced to feed on blackberry but did not survive. No specimens of *Bembecia* survived.

The most hopeful insect for the control of blackberry is *Coroebus rubi*. The larva of this bores down from the crown into the root and then returns to the crown, by which time it is fully fed. It then forms a large cavity within the tissues, where pupation occurs. This insect shows a great liking for *Rosa indica*, which, in Europe, is used as stock for many varieties. Exhaustive inquiries, however, have proved that it is seldom made use of in New Zealand. The following are commonly in use as stocks in this country: *Rosa canina* (dogrose) and *Rosa simplex* (*multiflora* or *poliantha*), mainly in the North Island; *Rosa laxa*, to a very small extent; *Rosa manetti*, to a great extent. Stocks of all these are now being grown so that *Coroebus rubi* might have a thorough test.

Unfortunately, at date of writing, all the imported specimens of this insect have failed, but a further supply is expected, and when these are received a very complete study is to be made of this parasite.

For information as to the progress of this work at the Cawthron Institute I am indebted to Dr. Tillyard, who kindly placed his reports on the subject at my disposal.

General.

With such a formidable list of insects, exhibiting such a variety of methods of attack, the biological control of blackberry may be regarded as distinctly encouraging. There are several points worthy of comment: Firstly, it is not likely that a parasite can be found which selects blackberry exclusively for its host; secondly, all the insects which attack blackberry (*Rubus fruticosus* Linn.) also parasitize the very closely related raspberry (*Rubus idaeus*); thirdly, the range of hosts, as far as is known, in the natural habitat, appears very limited—few hosts being outside the genus *Rubus*. If an insect or a collection of insects, or the combination of an insect and fungus, could be found to eradicate or control blackberry at the expense of raspberry, it would seem reasonable to sacrifice the latter; for it is hard to see that the loss of the small raspberry industry can in any degree be compared with the tremendous yearly loss caused to the country by the ever-recurring necessity for clearing roadsides and drains of blackberry, and attempting to prevent its further spread, together with the loss of good farming-land already rendered useless by blackberry infestation. Probably the cost to the country of the first of these items is far greater than the value of the whole of the raspberry crop for the Dominion.

Moreover, it must be pointed out that the insects likely to cause damage to blackberry and which also attack raspberry are comparatively easy to control. In the case of the gall-formers the infected canes can be cut out; while with the others a spray, applied sufficiently early to leave the fruit undamaged or without any adherent poison, should effect control.

It is interesting to note that up to the present insects have been found which attack the crown, the vines, the leaves, and the young shoots of blackberry, but no insect has been reported which feeds on the

flowers and young fruit. Hence, unless further investigation reveals such a parasite, if all else in the way of control fails, we cannot hope to prevent spread by biological means. Attack on the leaves and young shoots is an important point, for in this way the food-supply can be stopped and so in time the plant will become weaker and weaker; but the most reasonably hopeful parasite is the one which attacks the crown, for attack on this point is likely to more greatly damage, if not kill, the plant than at any other point. Attack above the crown cannot give much hope of rapid or effective eradication, though it would be a means of control.

A NEW PERCH FOR POULTRY-HOUSES.

L. W. C. COCKER, Poultry Instructor, Wellington.

THE object of this article is to bring under notice of poultry-keepers —on commercial plants in particular—a new method of supporting perches in poultry-houses. At present several styles of perch are in common use—for example, those suspended by wire catches, fencing-wire, or dog-chains, or those slotted into pipes let into dropping-boards and concrete floors. To a greater or lesser extent all are useful for the purpose intended, but some objections apply to them all.

The adoption of this new perch here described involves the discarding of the dropping-board. As regards this board, while it can be considered quite a satisfactory device when cleaned every morning, should it be left with accumulated droppings it becomes very insanitary and objectionable. The labour entailed in cleaning on large commercial plants is a big consideration, which has drawn attention to the desirability of devising some means of lessening the costs in this direction. Moreover, with this and the other systems of perching mentioned, features calling for consideration are practicability, efficiency, and convenience when cleaning or culling operations are being carried out. The floor-space covered by the dropping-board, even when the board is 1 ft. 6 in. from the floor, is not used to its fullest extent, because the active bird searching for food in the litter always works with its head to the light. Thus the straw is thrown towards the rear of the house, with the result that the litter accumulates there in a heap unless, of course, frequently attended to. In any case observation will show that the birds, even when all conditions are favourable, do not make as much use of the space as they would were the house free from obstruction.

Perches and similar furnishings of the fowlhouse which are not readily removable form an obstacle to efficient service in selecting stock. This is chiefly for the reason that as soon as disturbed the tendency is for the birds to congregate in the rear part of the house, the consequence being that they have to be continually stirred up in the search for the best specimens. With a clear floor the birds are in view practically the whole time, and the matter of selection is far easier.

In the perch illustrated it will be seen that an endeavour has been made to adopt the advantages and eliminate the disadvantages of the

FIG. 1.—THE NEW PERCH IN POSITION FOR ROOSTING.

FIG. 2.—THE PERCH FOLDED UP AGAINST BACK WALL.

[*Photos by H. Drake.*

various systems hitherto in general use. In the first place, it is of primary importance that the perch shall be as insect-proof as possible. This is provided for in that the perch-bracket is made entirely of metal (iron). Secondly, when culling the flock or cleaning the floor the perch may be folded up against the wall. This is an added facility in that the perches need not be removed in the event of the house being required for use as a storeroom, which is often the case in connection with the stove brooder and young-stock house. This point should commend itself to all rearers of first-class stock for breeding purposes,

FIG. 3.—SHOWING THE PERCH SUPPORT ALONE.

Above—bolted together for fixing to back stud; below—dismembered, with requisite bolts and nuts at respective positions.

who realize the value of ample exercise and fresh air, also sunlight and shade, for growing stock. Thirdly, when the perch is folded up in the daytime there is no inducement for the birds to roost instead of leading an active life by scratching litter. In the rearing of young cockerels, roosting by day is one of the difficulties to be contended with. Further, in folding up the perch during the day one not only eliminates the perching habit, but also one of the causes of that very common trouble, crooked breast-bone.

Some doubts may arise as to the wisdom of a perching system which does not provide dropping-boards, but it will be found that the

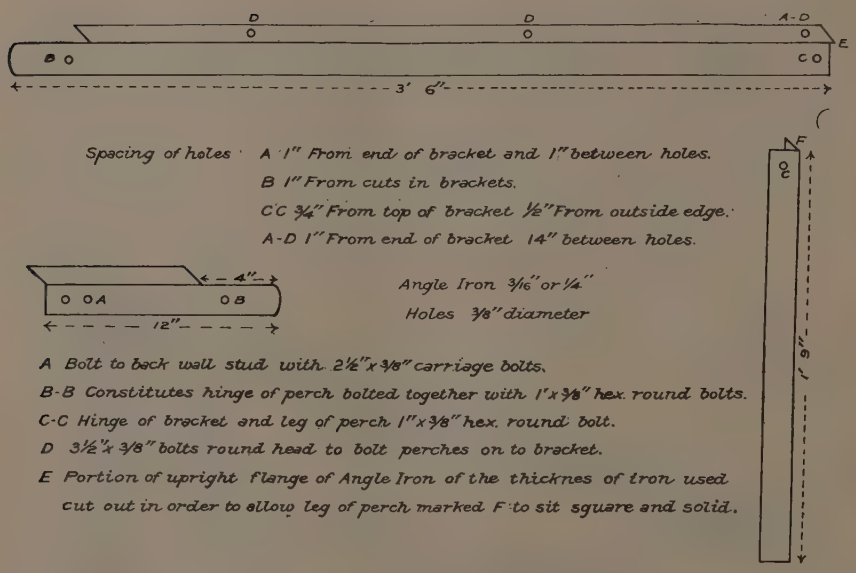
D
D
A-D
E
B B
C C
3' 6"
Spacing of holes A 1" From end of bracket and 1" between holes.
B 1" From cuts in brackets.
C C ¾" From top of bracket ½" From outside edge.
A-D 1" From end of bracket 14" between holes.
4"
B A
B B
12"
Angle Iron 3/16" or ¼"
Holes ⅜" diameter
A Bolt to back wall stud with 2½" x ⅜" carriage bolts.
B-B Constitutes hinge of perch bolted together with 1" x ⅜" hex. round bolts.
C-C Hinge of bracket and leg of perch 1" x ⅜" hex. round bolt.
D 3½" x ⅜" bolts round head to bolt perches on to bracket.
E Portion of upright flange of Angle Iron of the thicknes of iron used cut out in order to allow leg of perch marked F to sit square and solid.
F
C C
1' 9"

FIG. 4.—DETAILS AND DIMENSIONS OF PERCH SUPPORT.

droppings cause no trouble so long as the litter and floor of the house are kept dry. Actual experience has shown that no smell other than a slight aroma of ammonia is perceived. The litter, however, should be frequently stirred up, and a little fresh straw added at intervals when required.

In the course of time the action of the moisture in the droppings, together with the constant scratching of the birds, will cause the litter to become disintegrated and worked into fine particles, when it is most valuable as a dressing for either pastures or gardens. As a rule, where these conditions are complied with, it is unnecessary to clean the house more than once or twice during the course of the year.

These new perch supports can be made by any handy man equipped with a boring outfit, hacksaw, and vice. Either $\frac{3}{16}$ in. or $\frac{1}{4}$ in. angle-iron is suitable, and the necessary bolts and nuts can be purchased with the iron. The accompanying photographs give a good general idea of the device. They were taken at the Wallaceville Poultry Station, where this method has been introduced. The drawing supplies details of dimensions, &c.

PRICE OF STRYCHNINE FOR RABBIT-DESTRUCTION.

WITH reference to the sale of strychnine by the Live-stock Division for rabbit-poisoning purposes, farmers and others concerned are notified that the price for quantities of 100 oz. or more has been reduced to 2s. 6d. per ounce. The price for lesser quantities remains at 3s. per ounce.

SEASONAL NOTES.

THE FARM.

WINTER FALLOWING.

THE term "fallow" is derived from the Anglo-Saxon word "fealu," meaning yellowish-brown, and refers to ploughed ground left in an uncropped state. In medieval times the soil-fertility of arable land was maintained at a constant but rather low level chiefly by means of a summer and winter fallow. The arable land was divided into three fields, and the usual rotation was—winter wheat; barley, oats, or spring wheat; fallow. The summer fallow was the nitrate-accumulating one, while the winter fallow accumulated potash and phosphates. In modern agriculture, through the adoption of complete rotations and the use of artificial fertilizers, the summer and winter fallows have lost much of their importance as a means of making available plant-food in the soil. The fallows, however, are still of considerable importance as a means of regulating the amount of moisture held in the soil for the use of crops.

The practice of winter fallowing in New Zealand is chiefly confined to heavy land in sub-humid arable farming districts, when spring- and summer-sown root and forage crops follow a cereal. The land is ploughed in the late autumn or early winter and left in the unbroken furrow slices, so that the weathering agencies may have free play in breaking up clods, and in order to allow the winter rains to quickly pass through the top soil and enter the subsoil instead of running off the surface.

Root crops require enormous quantities of water. A 30-ton crop of mangolds, for instance, consumes about 1,500 tons; an inch of rain amounts to 100 tons per acre, so that at the yield stated 15 in. of rain would be required. The rainfall over a large part of the arable farming districts of Canterbury is about 25 in., and the normal rainfall from October to April is 14 in., which is insufficient for the crop, as only about one-third of the summer rains percolate through the soil, the rest being lost by evaporation. The root crops must thus draw upon the reserves of water held in the soil and subsoil. The months during which a large proportion of the rainfall may be stored in the subsoil are May to September, so that late autumn and early winter ploughing is essential for the production of good root crops. During May and June the teams on arable mixed farms are generally busy sowing winter wheat, but there are often periods when land can be ploughed, although the weather conditions are not suitable for cultivation work, and it is during these periods that heavy stubble land intended for root and forage crops should be ploughed if possible.

In the North Island root and forage crops usually follow grass, and the winter fallowing of grassland requires careful consideration. When grassland is ploughed in the autumn a skimmer attachment should be used on the plough, to turn part of the furrow slice to the bottom and so prevent grass growing between the furrow slices during the wet winter months. The winter fallowing of grassland containing twitch

is often disastrous; in many parts of the North Island pastures contain a good deal of brown-top, red-top, and Poa pratensis, and although these grasses may not be very noticeable in an old pasture before it is broken up they are rejuvenated by the ploughing, and grow vigorously during the winter when the land cannot be touched owing to wet weather. On light land red-top will often take possession of fallow ground in the winter, and brown-top often does the same on heavy land. Land on which these grasses are likely to be troublesome should never be winter-fallowed by skim-ploughing the grass in the autumn or early winter, but should be ploughed in August with a skimmer attachment on the plough, and kept worked up during the spring until the crop is sown.

WINTER FEEDING OF YOUNG STOCK.

The first winter is a critical period in the life of dairy cattle, and their subsequent development depends very largely on the feeding during this period. Calves should be the first stock on dairy farms to be given a ration of hay in the early winter. It is essential to get them used to hay and root feeding before the grass-growth seriously declines, because it is usually some time before calves will eat much hay, and if its feeding is left too late the animals often lose condition, which they will not pick up again. Besides adequate food, the calves should get an ample supply of pure water; dirty drinking-holes in drains are liable to lead to the young animals becoming affected with internal parasites.

Lambs to be kept over the winter should be well fed after weaning, so as to have them in good condition to stand the winter. Lambs affected with internal parasites should be drenched or given worm-tablets, kept on dry ground, and given frequent changes of pasture. In mixed-farming districts hoggets are frequently wintered on turnips, and care should be taken to see that they are doing well. At one year old the two centre milk-teeth are replaced by permanent teeth, and before this occurs the two milk-teeth become loose, the gums swollen, and the animal often has difficulty in eating the turnips properly. For this reason hoggets should be the first on the turnips, being thus allowed to graze the tops off. They are then followed by the fattening sheep, which clean up the tops of the bulbs, and they in turn are followed by the breeding-ewes after the shells have been lifted by the grubber. The hoggets in the meantime are placed on a fresh break of tops.

THE MANGOLD CROP.

A start should be made in pulling the mangold crop some time in May. Before feeding, the roots should be lifted and heaped to ripen. If fed while still growing or in an unripened state mangolds are liable to cause scouring, and many cases of tympany and abortion have occurred through feeding them green. When the crop is lifted the tops should be pulled off and left in the field, as they are of poor feeding-value, though they contain a considerable amount of fertilizing ingredients. The tops from an average crop of mangolds contain as much fertilizer as is contained in 4 cwt. to 5 cwt. of dried blood, 1½ cwt. of sulphate of potash, and 1 cwt. of superphosphate. In pulling mangolds care should be taken not to break the roots, or they will bleed.

The roots are preferably stored in a long heap under trees; if in the open, the top of the heap should be covered with straw to keep the frost off.

—P. W. Smallfield, B.Ag., Instructor in Agriculture, Ruakura.

THE ORCHARD.

LATE APPLES FOR EXPORT.

WHEN these notes appear the export of fruit will be drawing to a close, only the late varieties of apples remaining to be packed. Very little difficulty should be experienced with these, the colour question not having to be considered to such an extent as with some of the mid-season varieties. It is expected that a record crop of Sturmers will be exported this season, there being heavy crops in almost all districts. This variety is favoured on the overseas markets, and usually commands a good price; therefore every precaution should be taken to see that it arrives in good condition. The Sturmer is easily bruised, and although the bruises dry out, leaving a brown patch, the general appearance is affected. Remembering this fact, care should be taken in the handling right from the picking up to the time the fruit is placed on the overseas vessel. Packing can be slightly firmer than with some other varieties, although not so tight as to cause bruising in the cases. The regulations with regard to russet on this variety are very liberal, and there should be no difficulty in packing to the different grades. Of the other green varieties, Grannie Smith is probably the most important. Prices realized for this variety last season were very encouraging. It is a good carrier, and, like the Sturmer, is appreciated in Britain.

THE AUTUMN CLEAR-UP.

In many instances, especially where export is not carried on, all fruit will be gathered and disposed of by the end of this month, and attention should be directed to a general clean-up of the orchard before the usual winter work commences. Fruit-cases used in the handling of the crop should be collected, repaired where necessary, and stacked away for the following season. All diseased and cull fruit should be destroyed, thus reducing the chance of infection from this source to a minimum. Props used for supporting heavily laden branches in the orchard should be collected together, and stacked in a dry place for future use.

NEW PLANTING.

Where it is intended to plant new areas, the land can be prepared by thorough and deep cultivation, getting everything in readiness to receive the young trees. In some districts planting can be done in the autumn with advantage, thus giving the trees time to establish their roots during the winter and go straight ahead in the spring. Where the soil is inclined to be cold and wet, it is advisable to defer planting until the spring.

—G. Stratford, Orchard Instructor, Motueka.

Citrus-culture.

To maintain a citrus-grove in good order and continued profit is a much more difficult proposition than the establishment of young citrus-trees. Planting is usually done in spring, and the climatic conditions from then on up to late autumn are generally ideal for the growth of the citrus-plant—warmth, equable conditions, with periodic rain—but for permanent maintenance trees have to be fostered, and in some localities even coaxed, through periods of the year when climatic and other conditions are far from natural for citrus-growth. With the advent of this unfavourable season it is well to consider some of the main detrimental conditions to be avoided.

Soil Moisture and Drainage.—Excess of moisture in the soil is annually responsible for more serious set-back to trees and more total loss than possibly any other cause. All the citrus tribe delight in warm soil-conditions, as evidenced by their habit of surface rooting. To allow the ground to remain waterlogged can only result in unfunctioning if not decaying roots, and if the tree is not lost it receives such a check as to take more than normal time to recover in the spring.

Citrus-culture is most successful in parts of the world where the water content of the soil is regulated by irrigation. While we cannot regulate the amount of rainfall, there are several cultural points which, strictly observed, will minimize undue moisture in the soil. Drainage is, of course, most necessary, and should be attended to even before the trees are planted; but it is quite possible that consolidation of the land has to some extent nullified the effect of what was once thought to be ample under-drainage, so it is well to make sure that sufficient drains have been installed, and that they are properly clean and in good working-order. If not, the defect should be corrected, otherwise the success of the whole is prejudiced. Surface water can be quite as damaging as waterlogged subsoil. Early winter regulation of the hard surface should therefore be so done as to avoid hollows, and the land between the trees left with a double open furrow to take away surplus surface water.

Shelter.—The very nature of citrus-trees predisposes them to damage from exposure, broken branches or limbs, partial defoliation, a general hardening of the bark, and a loss of vitality. The main object to achieve in order to minimize this is adequate shelter on the windward side. Where no shelter exists, this should be remedied during early winter, so that shelter-trees or hedge-plants may be well established and ready to grow in early spring. Many existing shelters thought to be sufficient prove on examination to be deficient in so far as the ragged lower parts and gaps are concerned. This may be remedied by the erection of brushwood breakwinds and the growth of interplanted hedge or shelter plants.

Frost.—Much annual damage by frost is perfectly obvious, but reduction of vigour and retarding of development in the trees is also considerable, though not so noticeable. Most damage is done to young growth, and at a variable minimum distance from ground-level. In areas subject to light frosts only the trees therefore grow beyond apparent damage in a few years, but in these first years all possible protection should be given. Many adult trees also suffer injury, mainly to young growth, particularly that made during the previous autumn.

Proper spacing of branches and laterals, and the avoidance of highly nitrogenous manures during late summer, will permit the wood to mature to a greater degree of frost-resistance.

Clearing Tree-trunks. — Owing to the amount of collar-rot and decayed bark caused through fresh manure or decaying litter being piled up round the bole of the trees, it is wise at this season to thoroughly clean up around the trunks. A mulch of general litter or manure may be very desirable during summer, but is more often injurious during winter.

—W. H. Rice, Orchard Instructor, Auckland.

POULTRY-KEEPING.

SYSTEMATIC MANAGEMENT.

THE poultry-keeper who during recent weeks has acted on the principle of doing the right thing at the right time will now not only be well ahead in his work, but will also be working on sound lines. All surplus cockerels and hens which have passed their best period of production will have been marketed before this. Further, the best hens, and also the best of the cockerels reared, will have been selected and placed under special conditions, so that they may be in the best of nick for the forthcoming breeding season. The pullets will also be well settled down in their winter quarters under those favouring conditions which encourage the production of the much-desired winter eggs.

On plants where these important matters have been neglected till now there is no telling what loss it may mean in the long-run. For instance, with the great majority of the hens now moulting, it would be almost an impossible task to separate the likely future profit-makers and desirable breeding specimens from those that should have long since been culled. This being so, there will probably be retained in the flock many weak and non-paying types, while the worst loss of all will be experienced if any of the weak specimens are used in the breeding-pen—by the weak progeny which is almost sure to be produced. It should always be remembered that efficient culling and the selection of the most desirable breeding-hens can only be properly carried out before the moulting-period sets in, and those who have failed to do this will in all probability find it a costly mistake.

COLDS, DRAUGHTS, AND VENTILATION.

This is the time of the year for keeping a specially sharp watch for infectious diseases among poultry, especially diseases which have their origin in colds. Young birds are usually more susceptible to colds than adult stock. The most common symptoms of colds are sneezing, eyes watering, and a discharge from the nostrils, to which dust and dirt usually adhere. As soon as such signs are observed the affected birds should be promptly isolated. The next step should be to find the cause of the trouble and have it removed at once. There are so many things responsible for fowls catching cold that very often it is necessary to look for the cause in several quarters. Many poultry-keepers who have asked for advice in regard to colds have no idea as to their origin, and,

instead of trying to discover and if possible remove the cause, in most cases they look for one of the curative methods as the only safe course. The fact of their having the modern, deep, open-fronted, lean-to style of house leads them to believe that ideal conditions are being provided, and that a curative method is the one and only thing to resort to. This is all right in its way, but it should be remembered that the best style of house ever planned will not give entire satisfaction under varied local conditions. It is true that for practically any site and for prevailing local conditions the style of house described is the best arrangement yet evolved for providing shelter for the domesticated fowl; but if the best results are to be obtained the poultry-keeper must be always on the alert to observe weaknesses in the system, and make modifications to suit his own local conditions.

To give an example: I was recently called upon to advise regarding a flock of pullets affected with colds. The house they were sheltered in had much to recommend it, and gave all the requirements for the comfort and well-being of the stock, with the exception of one vital point which constituted a serious weakness—it was not draught-proof. Thinking that the ventilation provided at the front of the house was insufficient, the owner of the plant had made an open space of 3 in. between the top of the back wall and the roof. The danger from the draught thus created was intensified by the back wall being rather low and the fact of the birds being made to perch at a considerable height from the floor, so that they were practically subject to the full force of the draught all the time they were on the perches, just when they required the most comfortable conditions. It was not surprising in these circumstances to find that the birds were badly affected by colds, bordering in some cases on roup.

The point should never be lost sight of that in constructing a house for feathered stock the maximum amount of comfort should be combined with the maximum supply of fresh air, while every precaution should be taken to prevent the birds sleeping in a direct draught. The slightest crevice or crack is apt to cause an outbreak of colds. A good way of ascertaining whether or not the birds are sleeping in a draught is to visit the house by night and hold a lighted match or candle along the walls where the birds are roosting. If indications are that a draught is present the matter should be corrected at once. While it is true that a slight crack in the back or side walls may give one bird a cold, it must be remembered that the germs from this one, chiefly through being left in the drinking-water, may soon cause the whole flock to become affected.

Reverting to the question of having an opening in both the front and back walls of the house as a means of providing plenty of ventilation, it is certainly true that some flocks will keep free from colds and remain in a perfectly healthy state when these conditions are present. In such cases, however, there is usually some favouring local condition to counteract a direct draught and its evil effects. The site may be a well-sheltered one, where mild climatic conditions prevail, or the back wall may be sufficiently high and the perches at a low level, the birds not being subjected to the full force of the draught created. Where these and other factors are not present the question of having a ventilation-space at both back and front, and at all times, should be viewed

with caution. Especially is this the case when bad weather is being experienced. The principle of having ventilation-space at the back of the modern fowlhouse is perhaps carried out at its best when the opening is arranged in such a way that it can be closed or opened in accordance with prevailing weather conditions. In a general way, of course, especially during fine weather, there would be no objection to having an open space at the back of the house during the day. It is in compelling a bird to sleep in a draught that the chief danger lies.

POINTS IN HOUSE-CONSTRUCTION.

Some poultry-keepers have very long houses, and wire netting only is used between the compartments. This is a mistake, unless, of course, the site is particularly well sheltered, as a strong wind having nothing to break its force is apt to cause discomfort to the birds. On most plants it will pay well to have the partitions dividing the house made of some airtight material, such as asbestos-slate, beaver-board, &c. If the partition is to have the desired effect it should stretch the full width of the house, and not merely a few feet from the back wall. Where boards are used for the intersecting walls it is very important that there be no cracks for the draught to come through, otherwise colds and roup will soon appear. Indeed, in the many cases where I have been called upon to advise regarding troubles having their origin in colds, the greatest number could be traced to the intersecting walls not being draught-proof. For preventing draughts in a wooden dividing-wall it is a good plan to cover the latter with some airtight material, such as cheap roofing-material, &c.

The question of how much of the front of the house should be left open to provide ventilation is a matter that can be decided only according to the prevailing local conditions. Generally a space of 3 ft. is allowed, but experience goes to prove that where the plant is located on a bleak situation this amount must be reduced if colds are to be prevented. Good ventilation is an essential requirement for feathered stock of all ages, but it can be easily overdone, especially with the artificially produced young bird. This does not mean that the birds should be coddled, but rather that a sane course should be steered between too much ventilation and insufficient ventilation. Poorly ventilated quarters should always be guarded against, as in these the birds become overheated by night, making them susceptible to chill when they go outside in the morning. Then again, in order to resist colds the birds must not be overcrowded. Above all things, the quarters must be kept in an absolutely sanitary state.

—F. C. Brown, Chief Poultry Instructor, Wellington.

THE APIARY.

UNITING COLONIES.

THE presence of weak hives in the apiary must be avoided as far as possible. During warm autumn days these colonies rarely escape the attention of robber bees, and are easily molested. When once they are attacked the beekeeper will find it extremely difficult to save them, and eventually they will get robbed out despite his efforts. It is far

the better plan to unite the bees with a stronger colony than to run the risk of unsettling them in the dormant season through the encouragement of wholesale robbing.

COVERS.

With the approach of the rainy season it is advisable to make a complete examination of the hive-covers in use. Altogether too little attention is paid to making the covers watertight, and neglect in this direction lead to winter losses. No amount of labour should be spared in saving the bees from exposure and dampness, and by so doing warding off the large annual losses that occur through neglect. There is no excuse for the beekeeper neglecting to protect his bees, and he will find in the long-run that a small expenditure on some suitable waterproof roofing-material will doubly repay him, and will be the means of saving colonies that would otherwise be lost. Bees must be kept dry. An examination made of colonies where proper protection is not provided will reveal the presence of large quantities of propolis. Usually this is collected to prevent the penetration of external moisture, and it is noticeable that it is gathered freely in the autumn months. Where adequate protection is provided the bees are to a large extent saved the labour of collecting the propolis, and by providing dry roofs the beekeeper is assisting them. In the case of roofs that are cracked, do not attempt to tinker with them, but cover entirely with some waterproof material. In the long-run metal coverings are the cheapest and the best. Good zinc or galvanized iron makes ideal covering, and will last for years.

SPARE SUPERS.

Where extracted combs have been placed on the hives for the bees to clean up, these should be removed and the bees confined to as small a space as possible consistent with the size of the colony. It may be necessary to leave some of the supers on during the winter months, and these can be dealt with in the spring. Do not leave the bees more space than they require, as it will be found that they will desert the lower supers and cluster at the top for warmth.

MATS.

It should be seen that each colony is provided with one or two good mats during the winter months, to keep the bees as warm as possible. Mats should be cut to fit exactly on top of the frames, and may be made from clean sacking or canvas. Sugar-bags or cornsacks make excellent mats and are easily procured. Wood mats are adopted by some beekeepers, and, if desired, may be secured at a moderate cost from dealers in bee material. In districts where the bees do not bring in a great deal of propolis wood mats are effectual. On no account use calico mats, as these afford practically no warmth.

WEEDS.

The hives should be kept clear of all weeds, so that the flying bees may have free access to the entrances. Many bees are lost by striking growing obstacles on returning to the hives For the next few months, when the air is charged with moisture, it is important that plenty of air and as much sunlight as possible should penetrate beneath the bottom-boards. In damp situations place the hives sufficiently high

from the ground to avoid the dampness. Old bricks or concrete blocks make good supports for the bottom-boards. Make sure that the hives have sufficient cant towards the front before the winter rains set in. The presence of much moisture on the bottom-boards will be the means of loss to the beekeeper, and, in addition, cause the hives to become sour and foul-smelling.

CARE OF COMBS.

Good extracting-combs are the most valuable asset the beekeeper possesses next to his bees, and great care should be taken to secure them from the ravages of the wax-moth and mice. Hundreds of combs are destroyed annually through carelessness, and this can be prevented by attention to small details. Mice destroy the combs to gain access to the pollen and honey, and render the best combs foul and distasteful to the bees. Combs can be stacked in a mouse-proof room or in supers tiered one above the other. Queen-excluders may be utilized to keep mice out of the combs, and in the absence of close-fitting roofs are a complete success. If the presence of the wax-moth is detected the tiers of combs should be fumigated. Bisulphide of carbon is effective in destroying insect-life, but should be used with great care, as it is highly inflammable. Prevention is better than cure, and a few moth-balls placed in the supers will prevent attack of the moths.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

GREEN COVER-CROPS.

MOST of the land devoted to horticultural crops is under continuous cultivation, and requires careful nursing if its fertility is to be maintained. In the absence of stable manure, which has been relied upon chiefly for this purpose, the modern substitute is to grow a green crop and plough it in when it matures. Where chemical manures have been used freely during the summer a further application will not be needed now, but otherwise a moderate dressing should be applied when sowing, to stimulate the growth of the cover-crop. Hardy crops that will grow freely at this season are oats, tares, barley, horse-beans, and white mustard. A fairly heavy sowing should be made; it will smother the weeds and prevent the leaching-out of nitrates that would otherwise take place.

WINTER DRESSINGS OF ORGANIC MANURES.

Although such supplies are scarce, what can be obtained from woolsheds, cow-yards, and fowlhouses, and even seaweed, will be of great service where the material has been properly fermented and partially decayed. It should be used freely on such crops as rhubarb and asparagus, and on land that is to be planted with early crops such as spring cabbage, cauliflower, spinach, lettuce, &c. The addition of 2 cwt. to 3 cwt. of superphosphate per acre should be made with this application.

The proper preparation of these materials is important; if they are stacked in a compact heap and given some shelter from weather they will ferment, and all weed-seeds will sprout and be destroyed. The material is thus more readily available to the plants, and much trouble from weeds is avoided.

TRENCHING AND SUBSOILING.

After two or three years of constant ploughing or even digging the subsoil becomes compacted and hard in most soils; for that reason each year a portion should be given a deeper cultivation, more especially that area which is to be devoted to root crops. This may be done by double ploughing, or ploughing with a subsoil attachment. On smaller sections trenching may be done by turning over the top spit and breaking up the second, incorporating with the latter a liberal addition of organic manure or humus — an addition, however, which should be omitted where root crops are to follow immediately.

HEDGES AND DRAINS.

The proper care of hedges is peculiarly neglected in this country, where they are so valuable as shelter. In addition to unseasonable trimming they are usually cut so lightly that they become top-heavy and bare at the base, thus becoming weakened, inefficient, and covering much ground. The present time is suitable for trimming back most hedges. The sides should be cut hard back so that the hedge becomes narrow at the top. If the hedge is such as that above described, cut it well back on the one side this season, deferring the more drastic treatment on the other side for another year. This treatment admits the sunlight to the base, which will thicken up and give an improved appearance and efficiency.

We have been more concerned lately with a lack of moisture than a surplus, but the usual attention to drainage at this season should not be omitted. Early crops are always in demand, and for that a well-drained soil is indispensable. This may be secured by clearing now all culverts and open drains. Make a neat job of stacking the spoil; if it is not placed at the foot of a hedge, see that it is spread before it dries hard and becomes an unsightly obstruction.

EARLY SPRING CROPS.

Where, to avoid rust, lettuce seedlings for early planting are grown in frames they should be given air at all times, but during fine weather the sashes should be removed and the plants grown as hardy as possible.

On light, warm land the winter and early spring crops are often the main source of income. In such localities an early crop of peas may be obtained in some instances by sowing a dwarf early variety during the present month. Complete all planting out of spring cabbage and cauliflower and the blanching of celery.

STOREROOMS AND PITS.

Crops in storage will require careful attention for the first month or so, chiefly to avoid heating, a danger which threatens most where large bulks are stored in a comparatively small space or there is lack of proper ventilation. After that period surplus moisture will have dried off and the danger will be correspondingly reduced. Until then ventilate freely, especially in cold, dry weather. In a few instances there may be danger of freezing, but, of course, steps should be taken to avoid that risk.

—W. C. Hyde, Horticulturist, Wellington.

REVIEW.

EUCALYPTS IN NEW ZEALAND.

Trees from other Lands for Shelter and Timber in New Zealand: Eucalypts. By J. H. SIMMONDS. Quarto, xviii plus 164 pages, 76 botanic plates, and 28 scenic plates. (Brett Printing and Publishing Company, Auckland; £2 10s.)

IT is certainly not an exaggeration to assert that no one except its enthusiastic author—the Rev. J. H. Simmonds—could have produced this truly notable book, the first of its kind in this country, for its author year by year for many years has been fitting himself for the task. He has cultivated many kinds of *Eucalyptus*: he has studied in all parts of New Zealand the behaviour of the different species in cultivation; he has seen many growing in their natural habitats in Australia and Tasmania; he has examined the herbaria from which much information concerning their classification has been derived; and he has dived deep into the literature of his subject. These many-sided studies have produced a many-sided work in which most aspects of the subject, both practical and scientific (but can the two be disunited?), are discussed in plain terms and in vigorous English.

First of all must come here the essential matter of classification. Up to the welcome appearance of this book the knowledge of the cultivated species of *Eucalyptus* in New Zealand has been based on a quite insecure foundation. In no few cases one and the same group of plants has been known by different names —possibly none of them the right one—or groups distinct enough from one another have borne one and the same name! This sorry state of affairs, if Simmonds's book is followed, should before long be a thing of the past, since not only is there a good description of each of the seventy species cultivated in this country, but there is an authentic, life-size picture of each from the hands of those qualified botanical artists, Misses Flockton and King, who prepared the plates for Maiden's classical monograph on *Eucalyptus*. Thus exact figures of the types of those species which are grown in New Zealand are available for all who wish to find out the correct name of any eucalypt they want to identify. Certainly in the matter of the nomenclature of *Eucalyptus* there still remains much to be done in Australia, in the field rather than in the herbarium, especially in the way of finding out the true-breeding groups of individuals, the effect of environment, and, above all, the occurrence of wild hybrids, which must certainly be present, and probably in great abundance. The author himself embodies in other words similar ideas when he writes: "They of to-morrow will discern in those trees origins and kinships that are still hidden from our eyes. From this growing knowledge there will gradually emerge for the Eucalypts a classification upon which nature herself will place the seal of approval." Also, those who read between his lines will see that for practical purposes the author considers it is not safe to admit to cultivation a species on its name alone, but rather it is the best *strain* of the "species" which is wanted. Thus the author's philosophy concerning species is much the same as that of the reviewer, in that the species is frequently merely an abstraction, not a reality (*e.g.*, *E. amygdalina*), the realities being the true-breeding strains, or "jordanons" as they are now called by some.

The botanical plates are not the only illustrations of moment in the book. On the contrary, there are many of particular value illustrating the admirable results of intelligent tree-planting on large estates or in beautifying the surroundings of the home. They are, indeed, a striking example to be followed by those—far too great a majority—who ignore the aesthetic and whose land stands naked. Nor is such planting of no monetary value, direct or indirect, but quite the contrary, as the author conclusively proves.

What may be called the "Simmonds general classification" of the eucalypts is quite novel, but from the standpoint of utility the only classification of real moment. It is based on climate, with the frost-tolerating capacity of the species

coming first. This leads to the division into six groups of the seventy species of *Eucalyptus* cultivated in this country, commencing with those the least hardy (tolerators of virtually no frost) and ending with the most hardy (tolerators of a considerable amount of frost). Thus the landowner who wishes to plant, if he is properly acquainted with the climate of his neighbourhood, with the aid of the book under review can tell pretty well for certain which species will succeed with him and which he should avoid. Where particularly frosty he has a choice of only seven species, but where the frosts are not nearly so heavy (20°–26° F.), and the summer comparatively hot, twenty species may be cultivated.

Scientifically the Simmonds classification is sound, and it might quite well be correlated with the presence of various indigenous trees in any area: *i.e.*, the different natural forest areas of New Zealand might most likely each be an indicator of what exotic trees could be successfully introduced. Or, taking a rather wider view, the various botanical districts might serve as the basis for the tree-planter, since each has its locally endemic plants, its particular plant-associations, its florula, and its climate.

For each of the author's divisions of his species, in addition to the trees being well illustrated and described, there is given for each species an account of its natural habitat in Australia or Tasmania and of its latitudinal, altitudinal, and ecological distribution in New Zealand. It is information of this class—quite new except in a general way—which stamps the work as of particular value, such information having been acquired only by extended travel and careful observation. Also, the relative importance of each tree from the standpoint of its timber is considered. In short, the remarks concerning each species supply indispensable information in many directions—information which cannot be neglected by the botanist, the forester, the gardener, or the landowner.

There are many other matters dealt with in this exhaustive work—*e.g.*, cultivation for timber-production; prevention of fire; harvesting the crop; natural spreading of trees—nine species thus established are cited; the preservative treatment of wood; and popular and scientific names, with, rightly, a strong bias for the latter; but the book is full of information, and all is put forth in simple but powerful language.

That the book is a work of great merit no one can deny. That it must play a notable part in the forestry and tree-horticulture of New Zealand should stand self-evident. But to accomplish fully its splendid purpose it must be properly in the hands of the public and before their eyes. Every library in this country worthy of the name should have a copy of Simmonds's Eucalypts. It should be in every high school and every technical college. Nor is the book one for New Zealand alone. *Eucalypti* are grown extensively in the warm temperate zone throughout the globe. To the cultivators of these noble trees the world over Simmonds's work should appeal.

L. COCKAYNE.

INTERNATIONAL INSTITUTE OF AGRICULTURE PERIODICALS.

As the result of an arrangement with the International Institute of Agriculture, Rome, subscribers to this *Journal* may obtain the following periodicals of the Institute at a 10-per-cent. reduction on the ordinary subscription rates: (1) *The International Review of Agriculture*, which contains about 130 pages, and is published in English, German, French, Spanish, and Italian editions; reduced subscription for each edition, 17s. 6d. (2) *The International Crop Report and Agricultural Statistics*, published monthly in numbers each containing about 50 pages, and in English and French editions; reduced annual subscription for either edition, 9s. The combined subscription for both publications is 24s. 6d. Orders (with subscription) should be sent either direct to the International Institute of Agriculture (Publications Department), Villa Umberto, Rome, Italy, or to the Publisher, Department of Agriculture, Wellington, New Zealand.

PRESENT SEASON'S PEDIGREE JERSEY HEIFERS AT RUAKURA STATE FARM.
These 18-months-old heifers have been mated to the stud bull Holly Oak Beauty Knight. [*Photo by H Drake.*

WEATHER RECORDS: MARCH, 1928.

Dominion Meteorological Office.

THE dry weather which commenced about 20th December, and from which only partial relief was experienced in February, continued in many districts throughout March. Unfortunately, too, it has been most marked in some parts which suffered most in previous months—namely, Nelson, Taranaki, and the western portions of Wellington Province. Over the greater part of the Auckland Peninsula and in Hawke's Bay falls were above normal in March. In Canterbury and Otago, also, there were some cases in which the average was exceeded, and, in general, the deficiencies were not very serious in those provinces. Temperatures were, on the whole, mild.

The relative absence of westerly winds is still a characteristic of the season, while, on the other hand, the rate at which pressure systems move from the westward has remained rapid. The zone of prevailing westerlies appears, however, to be gradually pushing its way northward over the southern portions of the Dominion. The westerly type of weather ruled, indeed, from the 23rd to the 28th, but pressure was high to the north of the Dominion and the westerly rains practically did not extend north of Westland.

There were only two storms of any importance during the month. A cyclone of considerable intensity appeared north of the Dominion on the 5th, and, moving southwards, was centred near Auckland on the afternoon of the 6th. A secondary developed west of Kawhia during the 7th, and did not finally disappear till the 9th. Strong winds, mainly from a south-easterly direction, were experienced northwards of Cook Strait during the 5th and 6th, gale force being reached in places. Widespread rains fell in connection with this storm, but the western districts south of Auckland benefited little. There were some heavy falls northward of Castlepoint, but more especially in North Auckland. A cyclone of the same type was evidently centred to the north-east on the 14th to the 16th, causing fresh south-easterlies and rain north of Auckland and Castlepoint. Its centre, however, never approached very near the Dominion.

The second of the storms referred to was a cyclone which moved rapidly during the 25th to 26th past the south end of the Dominion. Strong westerly winds, reaching gale force at times in the Cook Strait region and southern Otago, blew on the 26th and 27th, while there was a strong westerly gale at Chatham Island on the 28th. The rains were again fairly widespread, but beneficial chiefly to southern portions of the South Island. A somewhat similar depression passed on the 30th, but this time its centre was farther south, and southern Otago was the only district greatly affected. Apart from the storms mentioned, depressions were mainly slight waves and the rain of a local nature. Waves passed on the 4th, 10th, 15th, 23rd, and 24th.

Anticyclone centres crossed some part of New Zealand on the 3rd, 14th, 17th, 29th, and 31st. That of the 17th was intense, and was almost stationary east of Otago until the 21st, when it decreased in intensity, disappearing finally on the 22nd.

The mild conditions, with lack of drying winds, have been favourable offsets to the lack of rain in the districts affected.

RAINFALL FOR MARCH, 1928, AT REPRESENTATIVE STATIONS.

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average March Rainfall.
	North Island.				
		Inches.		Inches.	Inches.
1	Kaitaia	4·74	7	2·00	3·58
2	Russell	4·18	9	1·38	3·13
3	Whangarei	6·18	10	3·24	4·52
4	Auckland	3·45	11	1·53	3·03
5	Hamilton	3·00	13	0·74	3·88
6	Kawhia	2·40	9	0·62	3·43
7	New Plymouth	1·14	5	0·54	3·62

RAINFALL FOR MARCH, 1928—*continued.*

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average March Rainfall.
	North Island—continued.	Inches.		Inches.	Inches.
8	Riversdale, Inglewood ..	3·22	8	1·07	7·39
9	Whangamomona	2·01	7	0·70	5·61
10	Eltham	1·85	7	0·82	4·68
11	Tairua	4·38	10	1·78	5·92
12	Tauranga	3·72	10	2·00	4·16
13	Maraehako Station, Opotiki	4·10	12	1·50	4·09
14	Gisborne	8·63	15	2·20	4·51
15	Taupo	2·09	4	1·20	3·25
16	Napier	4·05	16	1·17	3·29
17	Maraekakaho Stn., Hastings	5·33	14	2·24	3·10
18	Taihape	1·13	7	0·53	2·95
19	Masterton	2·10	14	0·41	3·15
20	Patea	1·53	4	0·90	3·62
21	Wanganui	1·24	5	0·52	2·62
22	Foxton	0·48	3	0·34	2·20
23	Wellington (Karori reservoir)	2·13	12	0·76	3·48
	South Island.				
24	Westport	2·39	11	0·56	5·80
25	Greymouth	6·34	12	2·41	8·70
26	Hokitika	8·23	10	3·04	9·70
27	Ross	8·26	8	2·98	10·35
28	Arthur's Pass	6·39	5	2·40	9·74
29	Okuru, Westland	12·34	8	4·30	15·48
30	Collingwood	0·86	8	0·33	4·19
31	Nelson	0·22	4	0·16	3·08
32	Spring Creek, Blenheim ..	1·92	7	1·00	2·16
33	Tophouse	2·42	6	0·63	4·33
34	Hanmer Springs	5·03	8	1·11	2·89
35	Highfield, Waiau	3·52	8	1·04	3·00
36	Gore Bay	4·07	11	0·98	2·29
37	Christchurch	1·11	9	0·39	2·05
38	Timaru	1·94	10	0·64	2·31
39	Lambrook Station, Fairlie ..	1·42	5	0·64	2·47
40	Benmore Station, Clearburn	1·66	9	0·58	2·69
41	Oamaru	2·46	8	0·98	1·73
42	Queenstown	2·52	7	0·94	2·60
43	Clyde	1·30	8	0·40	1·50
44	Dunedin	2·20	12	1·28	2·98
45	Wendon	1·49	8	0·31	2·68
46	Gore	1·19	17	0·28	3·27
47	Invercargill	2·64	17	0·84	3·90
48	Puysegur Point	6·21	15	1·30	8·00
49	Half-moon Bay, Stewart Island	6·16	14	1·76	5·79

Phormium Industry Investigations.—"Valuable work at present is being continued into problems of the phormium industry," stated the Acting-Chairman of the Research Council at its February meeting. "During the flowering period Dr. J. S. Yeates has pushed on with his researches into the characters of the various strains of phormium and the crossing of various varieties. Mr. P. W. Aitken is investigating further bleaching processes, and is elaborating other methods devised by him for the practical treatment of larger quantities of fibre on a commercial basis. Steps are also being taken to devise a system of fibre-strength tests so that valuable information may be readily secured upon the strength of different fibres and the influence that various processes exert upon this strength."

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

IODINE IN SHEEP'S DIET.

"BREEDER," Masterton :—

Can you tell me what is the best method of supplying iodine in a sheep's diet. I am quite convinced that some of my paddocks are deficient in iodine, more particularly since reading the article on feeding of live-stock by Mr. McLinden in the January number of the *Journal*.

The Live-stock Division :—

A simple and yet efficient means to employ if stock are grazing only is an iodized salt lick placed in suitable weather-protected boxes in the paddocks. If stock are being fed on meals it is preferable to administer the iodized salt by mixing it thoroughly with the meal at the rate of almost ¼ oz. per head per day. Iodized salt is prepared by taking 100 lb. of ordinary salt and drying it as thoroughly as possible by roasting. When dried, spread it out in a thin layer and sprinkle evenly with 4 oz. of potassium iodide which has previously been dissolved in a cupful of lukewarm water. Store in a dry place. It would be helpful to departmental work if a few untreated control sheep could be kept, when any difference due to iodine treatment could be noted, if resulting. A few of the points on which information would be appreciated are as follows: (1) Effect on wool quality, (2) effect on weight of clip, (3) rate of growth, (4) fecundity, (5) abortion, (6) sterility, (7) effect on size of the new-born.

HEDGEHOGS FOR ORCHARD.

M. N., Kawakawa :—

I have an idea of introducing hedgehogs into my orchard of 5 acres. There is a shelter-belt always within 200 ft. of any part, and there will be plenty of grass and rubbish among the trees until ploughing begins in spring. Therefore I think there should be ample shelter, while slugs, snails, crickets, woodlice, and cicadas are in plenty. Do hedgehogs eat fruit? Would they eat an apple to get at the moth-grub, and so help control? How about sprayed fallen fruit poisoning them? Do they climb or burrow? Wild cats and rats are in the bush, and my dogs about the orchard with me, but I suppose they can protect themselves.

The Horticulture Division :—

Hedgehogs are now plentiful in most of the closely settled districts of the Dominion. They hibernate during the colder months, but on mild nights they are active and will come out and tackle almost anything that is edible. Their partiality for birds' eggs has given them rather a bad reputation with some people. They would eat an apple, not necessarily for the grub; but they are small, with corresponding appetites. The orchard sprays would not be strong enough to hurt them. They live in the leaves and litter found in a hedge or plantation. They neither climb nor burrow, and find their spines a pretty good protection when attacked by dogs and other animals.

HONEYDEW ON BIRCH-TREES.

H. M. SANDERS, Kopua :—

Is there any remedial treatment for silver-birch trees which are blighted with what is commonly called "honeydew"? The branches become black and the leaves are coated with a sticky substance, and in a short time nearly all the leaves drop off. When the blight is at its height the trees are covered with flies.

The Horticulture Division :—

The honeydew secreted on the leaves and branches of your birch-trees is due to aphids or to scale insects. These sucking insects are often found on various trees in large colonies, feeding on the sap, and exude the sticky product referred to. Bees and flies gather and feed on the excretions of these insects. The honeydew acts as an excellent medium for the growth of a sooty mould, forming a black film which gives an unsightly appearance to the trees. The aphis can be readily controlled by a spray consisting of Black Leaf 40 (1 part in 800 of water). If the trouble is caused by scale insects, then an application of red-oil emulsion should be given (1 part to 50 of water). An orchard power-pump would be necessary to reach the upper parts of the trees.

TRANSIT OF EGG SETTINGS.

B. COTTERELL, Middlemarch :—

Please inform me if the transport of eggs for hatching purposes over a long distance—say, from Wellington to this district—in the course of which they would get a good deal of handling, would be likely to affect them in any way.

The Chief Poultry Instructor :—

Providing eggs are properly packed and not subjected to rough handling during transit they may be carried safely from the North to the South Island without their hatching-qualities being affected to any great extent. Usually, however, with the ordinary means of transit, there is a risk of the eggs receiving rough treatment and the hatching-qualities becoming affected. One bump, even although the egg does not get cracked or broken, is apt to spoil its chance of hatching.

DISINFECTANT IN STABLE MANURE.

C. S. KNIGHT, Mangere :—

Would you kindly inform me whether or not disinfectant in stable manure is injurious to plants. I have about 3 acres of pumpkins (the Red Warren squash variety), which were fairly heavily dressed with stable manure. The method adopted was to open a deep furrow, fill with fresh stable manure, cover over with about 3 in. of soil, and plant the seeds on the top. The crop has been almost a complete failure. I know the dry weather has handicapped them a good deal, but in spite of that I should have got a much heavier crop. My cucumber crop, treated in the same manner, has also been a failure. The stable manure used had disinfectant in it.

The Horticulture Division :—

The effect of disinfectants on stable manure would probably be to delay fermentation and decay, especially in a dry season. The disinfectants in general use and in usual quantities are not likely to be directly injurious to plants under such conditions as you describe. Your results are very likely due in the main to the dry season; a deep furrow filled with fresh stable manure and covered with 3 in. of soil may be a suitable seed-bed in a moist season, but in the dry weather we have had this summer it must have been very unsuitable for such water-loving plants as pumpkins and cucumbers.

FORTHCOMING WINTER SHOWS.

Waikato Winter Show Association: Hamilton, 29th May to 5th June.
Otago A. and P. Society: Dunedin, 2nd to 7th June.
Poverty Bay Winter Show Association: Gisborne, 6th to 9th June.
Taranaki Metropolitan Agriculture Society: New Plymouth, 12th to 15th June.
Manawatu A. and P. Association: Palmerston North, 19th to 23rd June.
South Taranaki Winter Show Company: Hawera, 27th June to 4th July.
Auckland Winter Show Association: Auckland, 11th to 21st July.

WHEAT AND OATS THRESHINGS.

TABULATED below are returns of actual threshings received by the Census and Statistics Office up to 19th March from threshing-mill owners, and covering the months of January and February, 1928:—

Land District.	Wheat.		Oats.	
	Quantity threshed.	Average Yield per Acre.	Quantity threshed.	Average Yield per Acre.
	Bushels.	Bushels.	Bushels.	Bushels.
North Auckland ..	..	..	..	..
Auckland	311	18·29	..	..
Gisborne	1,947	26·31	..	..
Hawke's Bay	2,334	30·31	6,072	29·91
Taranaki	..	..	..	..
Wellington	23,526	39·34	9,186	39·77
Nelson	10,176	25·63	4,180	31·91
Marlborough	45,047	32·15	18,396	33·15
Canterbury	954,633	39·89	480,384	43·77
Otago	118,246	38·47	72,339	45·52
Southland	66	16·50	14,374	54·04
Dominion totals and averages	1,156,286	39·10	604,391	43·37

OCCUPATION AND UTILIZATION OF LAND IN NEW ZEALAND, 1926 AND 1927.

THE following table summarizes the condition of occupied land in New Zealand for 1926 and 1927:—

—	1926.	1927.
	Acres.	Acres.
Orchards, market gardens, vineyards, nurseries, and seed-gardens	32,433	31,252
Crops	1,645,719	1,769,862
Area occupied by residences, outbuildings, gardens, &c.	64,872	64,783
Fallow land	135,355	124,003
Sown grasses	16,615,960	16,680,348
Phormium tenax (New Zealand flax)	57,780	69,420
Tussock and other native grasses	14,298,618	14,197,853
Fern, scrub, &c.	4,165,576	4,123,743
Plantation	88,656	160,188
Standing virgin bush	4,176,569	4,099,032
Barren and unproductive land	2,325,291	2,267,214
Totals	43,606,829	43,587,698

In this table " barren " land is defined as that which is incapable of being put to profitable use, and not merely that which is barren because unused. Types of this land are mountain-tops, cliff-faces, shingle-beds, &c. It must be recalled that this table does not profess to give the condition of all land, as the total area of the Dominion is 66,390,262 acres, whilst the area occupied in 1927 was returned as 43,587,698 acres—a difference of 22,802,564 acres.

—*Census and Statistics Office.*